THE RENAISSANCE SACKBUT AND ITS USE TODAY

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The Metropolitan Museum of Art

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Preface

THIS BOOKLET is primarily addressed to amateur trombonists and sackbuters. I myself am an amateur sackbuter with some knowledge of Renaissance music and a few other Renaissance instruments, including recorders, krummhorns and tenor cornetto, but I make no claim to being either a musician or a musicologist, and the topic, as it is treated here, concentrates very much on the physical characteristics of the sackbut, on their relationship to the distinctive sound of this instrument as compared to its modern descendant, and on the problem of reproducing that sound today. If the publication has any merit, it is because I have tried to apply the same method and perseverance that have served me in Egyptological research.

My indebtedness to others is enormous, as will be apparent from the footnotes. Here I should particularly like to acknowledge the help and encouragement of Laurence Libin, Stewart Pollens, and other members of the Metropolitan Museum's Department of Musical Instruments. That Department should not be held responsible, however, for any of the opinions I have given concerning modern sackbuts in Appendix II; these opinions are based solely upon my own experience and that of others who have no connection with the Museum. I also want to acknowledge the help of Mr. and Mrs. Richard Sacksteder (Martha Bixler), who offered me many useful comments on an earlier attempt of this kind; Jacques Leguy, who has made all kinds of useful suggestions and allowed me to quote them here; and John Henry van der Meer who, of all museum curators, has been the most generous in providing data, photographs, and even books. Also to Dr. Manfred Schmid, who placed his sackbuts at my disposal and provided information about them at a time when he was intensely preoccupied with the installation of a new exhibition which will bring together most of the musical instruments in Munich's museums for the first time. And a special word of thanks must be given to Geert Jan

van der Heide, who brought me to the end of my search for a modern sackbut that has an authentic sound.

Throughout my preoccupation with this subject I have benefited from the unfailing collaboration of Mrs. Veronica Hamilton, who has arranged for interlibrary loans of books and articles, helped in pursuing references, and handled all sorts of other tasks, including the typing of more than one version of this manuscript. The services of Jane Fluegel were obtained to undertake the final editing, and her work has resulted in numerous and most welcome improvements.

Despite all of the assistance I have received, my essay still lacks some data I should like to have included, such as more extensive information concerning the precise pitch of the instruments as differentiated from a′ = 440.* And there must be several other small workshops, such as those of van der Heide in Holland and Egger in Switzerland, that have been omitted from my list of manufacturers (Appendix II). I should be very grateful for any information about such omissions and for suggestions of any other kind.

Were this little volume of sufficient importance to warrant a dedication, that tribute would be made in memory of Lila Acheson Wallace, whose benefactions have financed its publication.

Designation of pitch: I have followed the system used by Baines 1976, in which Middle C and the notes two octaves below, and one octave above it, are written C, c, c′ (Middle), and c″, as exemplified in note 23 below.

* At the last moment I have received a further series of pitch measurements from Geert van der Heide. Although they are "not scientifically reliable," having been taken from a tape recording made in Nuremberg, they may nonetheless be worth comparing with the data given on p. 8 below:

Alto by Hieronimus Starck, 1670 (e): a′ = 437.
Tenor by Anton Drewelwecz, 1595 (B flat): a′ = 443.
Bass by Isaac Ehe, 1612 (E flat): a′ = 450.

Illustrations

I

Some Persistent Questions

In view of the trombone's apparent simplicity, and the considerable number of Renaissance examples that have survived and are still playable, it seems astonishing that there should be such divergence of opinion about the antique prototype. Thus, while at least a few musicologists in Europe have long since been aware that the bells of Renaissance trumpets and trombones had exceedingly thin walls,[1] the contrary is stated by nearly all authorities writing in English. They declare that "the earlier trombones had thicker walls,"[2] or speak of the "thinner walls" of the modern instrument,[3] or say that "the actual thickness of the walls of the tubing is greater in these older trombones than is the case now."[4] Anthony Baines does not make such a comparison but (without specifying exactly which ancient brass instruments he is talking about), says that the wall thickness is usually about 0.5 mm; one can only assume that he is referring to measurements taken from the unflared tubing, which had about the same thickness as it does today.[5] The worst offender in this respect is G. B. Lane, in a recent volume wholly devoted to sackbuts, to whom it had been pointed out that a seventeenth century tenor in the Stearns Collection (University of Michigan, Ann Arbor) had "paper-thin walls," and who nonetheless retains, without question, the idea that the bells of sackbuts were often heavier; from this evidence he surmises that the thicker-walled examples were more apt to survive,[6] but he has not taken the trouble to verify that hypothesis by investigating any of the other surviving examples.

[1] Wörthmüller 1954–55, pp. 379, 386 (referring to trumpets), p. 396 (sackbuts).

[2] Sachs 1940, p. 326; Kenton 1957, p. 75.

[3] Dart 1954, p. 37.

[4] Gregory 1973, p. 30.

[5] Baines 1976, p. 21. For the thickness of the metal in the tubing see also Wörthmüller 1954–55, pp. 402 ff.

[6] Lane 1982, pp. 74, 139. Heyde 1980, p. 38, cites two examples of thicker-walled sackbut bells, but both instruments are dated well into the eighteenth century.

A second point of contention is the degree to which the sound of the ancient sackbut differs from that of the modern trombone. Lane follows Anthony Baines in considering the difference to be negligible, citing a story that Baines tells about a symphony trombonist who took the Neuschel 1557 sackbut and "instantly performed upon it the solo in Ravel's 'Bolero' and pronounced it an excellent instrument . . . the narrow funnel-shaped bell . . . helps to subdue the tone."[7] Elsewhere Baines more specifically describes the qualities of the Renaissance sackbut and does not suggest that they had a different timbre.[8] In following Baines in this, Lane inconsistently contradicts the opinion of Ehmann, whom he quotes almost verbatim for four pages,[9] even though Ehmann's enthusiasm for the *Urklang* is bestowed on modern reproductions (by Finke) that were probably far from living up to their ancient prototypes. Lane draws another argument from a statement quoted by Galpin, that the seventeenth-century musicologist Mersenne cautioned against imitating the military sound of the trumpet instead of the human voice, so that the sound produced was more warlike than peaceful.[10] Of somewhat greater ambiguity is Praetorius' inclusion of "einer stillen Posaun" among the constituents of a broken consort.[11] Since, in my judgement, the Renaissance sackbut was designed as a soft-toned instrument, I think the adjective is meant as a characteristic attribute rather than as a qualification that was not always to be expected. As for the avoidance of the trumpet sound, that is something Mersenne speaks of elsewhere, in a context that implies that it has more to do with the mode of attacking the notes rather than the instrument's volume.[12]

[7] *Ibid.*, pp. 138–139 (citing Baines 1950).

[8] Baines 1976, p. 114 (where the sound of the ancient instruments is described without any indication that it differed from that of modern ones). Baines may be unduly influenced by the Neuschel 1557 tenor, formerly in his possession, which, as will be seen presently, is not typical.

[9] Lane 1982, pp. 79–85 (without making it clear that all this is virtually a quotation).

[10] *Ibid.*, p. 138, quoting Galpin 1906, 21; the source, which Galpin does not identify precisely, is Mersenne 1635, p. 111: ". . . Musico ita debet inspirari, ut Tubae militaris sonos non imitetur, magisque accedat ad vocis suauitatem, ne reliquorum Instrumentorum, ipsatumque vocum humanarum concentibus officiat, & sonum potius militarem quam pacificum edat." Galpin's translation is less repetitious: "It should be blown by a skillful musician so that it may not imitate the sounds of the Trumpet, but rather assimilate itself to the sweetness of the human voice, lest it should emit a warlike rather than a peaceful sound."

[11] Praetorius 1619, III, p. 5. The "Consortium" series, edited by Mönkemeyer and published by Heinrichshofen's Verlag, regularly quotes this passage with an English translation in which the "stille Posaun" is misleadingly rendered as "solemn trombone."

[12] Mersenne 1635, p. 343 (partly quoted by Lane himself, *loc. cit.*).

Admittedly the sackbut had considerable dynamic range, and did in fact serve as a bass for shawms, as is well illustrated by a fifteenth-century Florentine painting reproduced by Galpin 1906, pl. 2, facing p. 12. But this need not imply that it was particularly suited to accompany loud wood winds; it may initially have assumed this role for want of a better alternative, and as successor to the trumpet, which had served as a higher contratenor, along with a pair of shawms.[12a]

For Lane the only essential difference between a Renaissance sackbut and a modern trombone is the size of the bell, and he accordingly endorses the procedure of cutting down the bell of a modern instrument, perhaps adding embellishments such as a garland; while he concedes that this would not be a truly authentic reproduction, he believes it would be "capable of producing the sound of the old trombone."[13]

The obvious way of resolving this question is to hear the ancient instruments speak for themselves. Among the available recordings, I have been particularly impressed by the earlier performances of Konrad Ruhland's Capella Antiqua in Munich. They are especially illuminating because they combine sackbuts and voices, so that one can appreciate the extraordinarily voicelike quality of the instruments: an alto by Hanns Hainlein, dated 1650, and a tenor by Johann Leonhard Ehe II, ca. 1690, both from Nuremberg.[14] The sound is altogether in keeping with the principal roles of the sackbut—to provide the tenor and bass lines for voices and for the equally voicelike cornetto. Unfortunately, however, I can cite only one recording that uses the ancient instruments in this manner;[15] more recent recordings of the Capella Antiqua have a quite different (and, to my ear, more modern) sound as far as the sackbuts are concerned.[16] Perhaps the recording engineer is partly responsible, but it

[12a] For this "loud music," see Baines 1976, pp. 102–103, and his article in *Galpin Society Journal* 3 (1950), 21, citing Tinctoris.

[13] Lane 1982, pp. 78–79. In giving this opinion, he cites Robert Sheldon, who believed that sackbuts varied in thickness, "leaving us a little more leeway in reconstructing the old instruments, or else in cutting down modern trombones in imitation of old ones" (*ibid.*, p. 74). For this procedure, see also the conclusion of Appendix II below.

[14] Dr. Ruhland has kindly supplied me with this information, but I have not been able to obtain any details, such as the slide bore or diameter of the bell.

[15] "Voices from the Middle Ages" (Nonesuch Records H71171, esp. Side I, tenth band), part of which is included in "A Nonesuch Christmas" (H71232).

[16] E.g. "Heinrich Isaac, Missa Carminum; Ludwig Senfl, Missa Per signum crusis," (Christophorus Verlag, Freiburg im Breisgau SCGLX 75 936), where the tenor of Johann Leonhard Ehe, ca. 1690, is specifically designated. Here the sackbut rises above the voices and no longer blends with them.

must be acknowledged that the sackbut can have a very different sound, depending on the way it is played, and that a professional trombonist might well compel it to speak more like the modern instrument to which he is accustomed, especially if, in addition, he uses his customary mouthpiece rather than the older flat-rimmed kind, which will be described presently.[17] I do not believe, however, that the reverse is true; the trombone can certainly be played softly, but if it is, it still does not have the sound of an ancient sackbut, when the latter is played as it should be.

Fortunately the custodians of most European collections of musical instruments are very cooperative, and I have been able to try the instruments themselves in Paris, Nuremberg, and Munich. From this much more reliable evidence, I am not only persuaded that the sackbut sounds distinctly different from the modern trombone, but have also obtained a clearer idea of the *Klangideal* that I am pursuing.

A third question about which there is diversity of opinion is the shape of the instrument's mouthpiece. On the one hand, we are advised by Ehmann to use "mouthpieces with as shallow a bowl and as narrow a bore as possible";[18] on the other hand, Baines declares that in all cases "the cups have sharp wide throats."[19] As will be seen presently, the truth lies somewhere between.

The pitch of the Renaissance tenor sackbut is probably no longer a matter of controversy, although here again some questions remain to be answered. While the surviving examples are generally close to B flat, by modern standards, the fundamental note in first position was originally read as A, conforming to a pitch about a semitone higher than our own (which Baines takes to be the "Cornett-ton"). This conclusion is well and succinctly argued by Baines, principally on the basis of Speer's explanation of the positions (1697).[20] The clinching argument is that the fourth of

[17] I have also heard recordings by other groups in which at least one ancient sackbut is included but played, or recorded, in such a way that its antiquity is difficult to recognize. An exception is "Instrumental Music at the Court of Maximillian I" (MHS1716), which includes a tenor by Friedrich Ehe, 1700; apart from Isaac's "Innsbruck," the instrument is heard to good advantage. Mention may also be made of "Tower Music" (MHS1804), parts of which are played by an amateur sackbut ensemble, the Salzburg Tower Brass. They use reproductions but succeed in obtaining something definitely closer to an antique sound than is heard from modern brasses recorded on the same record.

[18] Ehmann 1958, p. 223.

[19] Baines 1976, p. 113.

[20] Baines 1976, pp. 114–115. Endorsed by Guion 1980, p. 25, who adds some support from Virgiliano, *Il Dulcimielo*.

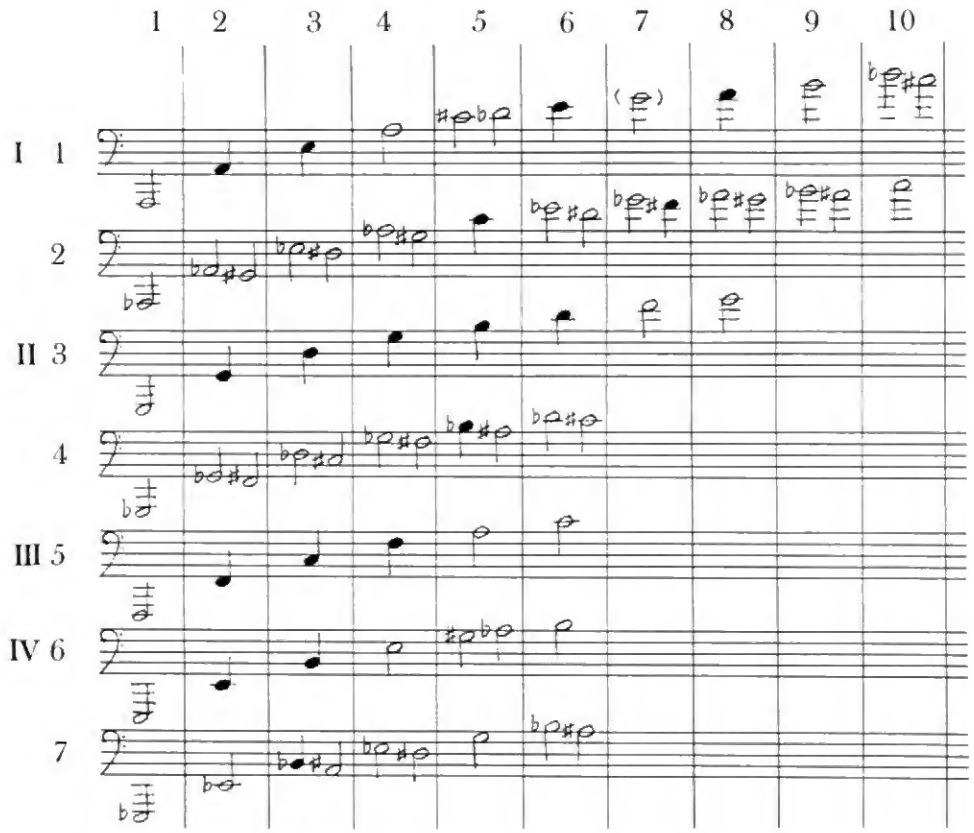


FIGURE 1

The numbers at the top refer to the harmonic series, those at the left to positions (diatonic in Roman numerals, chromatic in Arabic ones)

four diatonic positions is "as far as the arm can reach" and gives the E series of harmonics, then, "a little further out," the note B flat, "which enables a bass part to be played on a tenor trombone." This clearly implies that B flat was not to be found in first position. The chart in Fig. 1 shows the A positions, with Speer's diatonic series indicated by Roman numerals, and with black notes indicating those he assigns to that series, or to a half-step below them.[21]

There is, to be sure, a remaining problem about Speer's positions; his second diatonic position is "by the bell" and is said to give the G series;

[21] Speer 1687/97, p. 222. He shows g′ sharp among the notes of his first "Zug," along with c′, but adds that c′ and f′ sharp are to be extended the length of a modern position. Baines 1976, p. 114, rightly sees that there is a confusion between g′ sharp and f′ sharp but wrongly eliminates the latter, whereas I eliminate the former. Guion 1980, p. 26, also thinks that g′ should be retained but takes the sharp beside it to be a mistake.

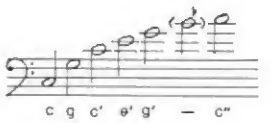
his third position, giving the F series, is similarly located two modern positions below the bell. But this would only be possible if the bell were located as it is today, near our third position rather than the fourth, as was generally the case in the Renaissance.[22] Speer's reference to the bell would in itself point to the concept of B flat as the fundamental in first position, as would a statement by Praetorius that the normal range of the tenor was as high as f′ and as low as E.[23] Might these discrepancies be explained by the possibility that at least two systems of positions were in use? As far as Praetorius is concerned, that possibility is reinforced by a further statement he makes concerning pitch (pp. 26–27 below).

David Guion in restating Baines' position, continues to argue, more dubiously, that the A-pitch was applied to the tenor trombone because, in a tabulation of seventeenth-century examples of tenor trombone parts, the total incidence of B naturals outnumbers that of B flats by a ratio of 2 to 1.[24] On the other hand, in looking through the late fifteenth-century collections of instrumental music, including the instrumental pieces from the Glogauer Liederbuch (ca. 1480),[25] and the pieces in Bologna Q 16 (1487),[26] and Sicher's Spielbuch (1500),[27] all of which date back much closer to the period when the sackbut was invented, I find that the B flats

[22] See note 41 below, where it will be observed that the location of the bell continued to be in modern fourth position some years after Speer's statement was published.

[23] Praetorius 1619, II, p. 31: "Gemeine rechte Posaun . . . darauff man natürlich oben biss ins f unten ins E kommen." Guion 1980 notes (p. 25) the discrepancy but does not explain it. Praetorius also says exceptional players could sound A′ (the pedal note of the B flat tenor in second position) and D, which modern trombonists manage to voice halfway between fourth and fifth, as I have learned from Michael Fitzgerald, a professional player.

Mersenne 1636, p. 342, describes yet another system of tenor positions based on c rather than on A or B flat. Since he says that the octave (c′), the twelfth (g′), and the fifteenth (c″) are made without extending the slides, it is obvious that he ignores the pedal note as the first harmonic. He inexplicably begins by explaining a descending octave beginning and ending with sol (g′-g). Then, to make the second octave by rising and going up to the fifteenth, he evidently begins with c′ and goes up to c″, in what we would now call the eighth harmonic; both octaves begin and end in first position:



[24] Guion 1980, pp. 26, 28.

[25] *Das Erbe Deutscher Musik*, Band 4; *Das Glogauer Liederbuch*, ed. by Heribert Ringmann, (Bärenreiter, Kassel, 1954, from the 1936 edition), Part III, pp. 45–79; Part IV, pp. 80–95.

[26] Fifteenth Century *Anonymous Chansons from Bologna* (Civico Museo Bibliografico Musicale MS Q 16), ed. by Mary Benton, "Ogni Sorte Editions" SR-I (Miami, 1981).

[27] Friedrich Sicher, *Ein altes Spielbuch*, ed. by F. J. Giesbert (Schott, Mainz, 1936).

outnumber the B naturals, and by a ratio of 2.6 to 1, 60 to 1, and 7.5 to 1, respectively, while the scarcely later corpus of Heinrich Isaac's secular works[28] has a ratio of B flats to B naturals that is more than 3 to 1.[29] I would therefore not find it more convenient, in playing the earlier music, to use an A-tenor, as Guion advises, so that B natural would be taken in sixth position and B flat in seventh. Nor would the use of such an instrument be more authentic. If one were to insist on authenticity in this matter, it should, as Baines says, be a question of playing the music a semitone higher.[30]

There are other problems too, ranging from the comparative size and detailed dimensions of sackbuts to the question of what may constitute an acceptable reproduction. The last consideration has preoccupied me particularly, and it is the ultimate objective of this publication.

[28] *Denkmäler der Tonkunst in Österreich*, 14. Jahrgang (1): Heinrich Isaac, *Weltliche Werke*, ed. Johannes Wolf (Vienna, 1907), excluding the few examples of questionable authorship. I have not been able to obtain the supplement, *ibid.*, 16. Jahrgang (1), 1909. Isaac was born ca. 1450 and died in 1517.

[29] This music does not, of course, specify that the bottom part should be played by a tenor sackbut, but prior to the seventeenth century the choice of instruments was nearly always left to the performers; see Egon Kenton 1957, p. 74, who stresses "the practice of fortuitous instrumentation, i.e., the assigning of instruments on the basis of clef rather than idiom or timbre." This was, however, subject to "a predilection for a blended sound and a mellow one." It goes without saying that I have eliminated, in making my tally of these collections, all pieces that descend below the range of the tenor. Musica ficta is taken into account, although it does not weigh very heavily in the proportions I have given.

[30] Baines 1976, p. 115.

II

The Characteristics of the Renaissance Sackbut

SINCE the tenor was the size of sackbut that was most commonly used (the "rechte gemeine Posaune," as Praetorius called it), it has been taken as the basis of the following description. For the terminology, see Appendix III.

Pitch. In the vast majority of surviving examples of the sixteenth–seventeenth centuries, the lowest usable note in first position has been taken to coincide fairly closely with B flat, considered in terms of modern pitch (a′ = 440). Unfortunately, more precise data are lacking in most cases. One example actually corresponds to a′ = 440,[31] but three others are sharper, with a′ equaling 452.4,[32] 455, and 460.[33] The last approaches B natural, and at least one tenor is actually identified as such, although the value of a′ is not specified, and it was evidently not quite so high originally.[34] As mentioned earlier, the instruments were also played a semitone higher, so that the bottom note in first position was equated with A.

In this connection it may be added that it is advantageous to have a sackbut that is somewhat sharper than the highest pitch required, for the instrument, once it has been made, cannot be shortened without return-

[31] The B flat tenor of Georg Ehe, 1619, from data supplied by Jacques Leguy. Baines 1976, p. 117, thinks it may be a lower-pitched "secund" or "terz" trombone. I am informed by Dr. René de Maeyer that the bass of Hans Hainlein, 1668, is in F at the same pitch, and another by the same maker, 1631, is in E♭ at a′ = 442 (Heyde 1980, p. 189).

[32] The Jörg Neuschel tenor, 1557: Galpin 1906, p. 22.

[33] From information provided by Dr. Manfred Schmid in Munich. See Appendix I, C, Nos. 4 and 5. The alto A, No. 1 is a′ = 455 and a bass in F by Anton Schnitzer, 1598, is a′ = 460; both are in the same museum.

[34] See Appendix I, B, No. 11, which also provides data concerning the bore and bell diameter, and note 123.

ing it to the maker; but it can easily be lengthened by tubes placed either between the slide and bell sections (lowering the pitch) or between the slide and mouthpiece (for smaller adjustments of tuning), as will be described presently.

Bore. A very narrow bore is characteristic of nearly three-fourths of the 22 examples for which I have adequate information; the bores are mostly about 10 mm or slightly more, and rarely as little as 9 mm (see Appendix I). The slightly wider examples are apt to occur when the slide near the bell is a little larger than the outer one (what is now called "dual bore").[35] A relatively small number of tenors have a distinctly larger bore, measuring 12 mm, or nearly so. They include the second oldest sackbut that has been preserved, made by Jörg Neuschel in 1557. It has been doubted that the slide of the third oldest wide-bore example—the work of Georg Ehe, dated 1619—was made for the bell section to which it is attached,[36] although its flat stays show that it is relatively early, and the large diameter of the bell opening would suit the wide bore. There are three other examples, all dating to the end of the seventeenth century—as well, of course, as some that may not be known to me. Baines thought the wide bore of the Neuschel sackbut might be a survival of earlier usage, i.e. that the Renaissance tenor may originally have had a 12 mm bore.[37] This suggestion seems unlikely, however, in view of the relatively late date of four of the other five examples, and the fact that at least four sixteenth-century examples have narrow bores, including the 1551 tenor of Erasmus Schnitzer. Possibly the larger-bore sackbut was used to take the lower part when two tenors were played together, and was more apt to be turned into a bass by means of crooks that lowered its pitch by a fourth. To judge from the instruments I have played in Munich, it is scarcely less dry in tone than its narrow-bore counterpart, but the tone is somewhat rougher and the volume louder.

[35] Lane 1982, p. 78, inaccurately attributes a bore size of 13 mm to the tenor of Erasmus Schnitzer, 1551, yet refers to this as a "narrow bore." Such a bore would, in fact, be found only in a Renaissance bass, and even then in one of the wider-bore examples. The error of measurement was evidently picked up from Fritz Jahn; (cf. Wörthmüller 1954–55, pp. 472, and 480, n. 217).

[36] According to Jacques Leguy, acoustical engineer and maker of Renaissance instruments. This instrument is also unusual in respect to its relatively low pitch (cf. p. 8 above), and the presence of two tubular bell stays instead of a single flat one; evidently these are nineteenth-century replacements (cf. n. 53 below).

[37] Baines 1976, pp. 111–112. Cf. the much more exaggerated version of this opinion expressed by Heinrich Thein (note 102 below).

The difference between the tenors of narrow and wider bore is not confined to the slide. The narrowness of the slide continues into a more slender bell, and in each case it is only beyond the bell bow that there is any increase at all in the diameter of the external tubing; in fact, the tubing between the slide and the bell bow is sometimes narrower.[38] The bulkier bell of the wider-bore sackbut may be seen in comparing the tenors of Paul Hainlein, 1653 (Fig. 2), and Jörg Neuschel, 1557, both in Vienna, (Fig. 3), although the latter may be an exceptional case.[39] This difference also affects the size of the bell opening, but not necessarily to any great extent; in the present case the bell of the Neuschel tenor has a diameter only 0.5 cm larger than the one compared.

The bore of bass sackbuts is frequently no greater in diameter than that of the wide-bore tenors, and in one exceptional instance—the bass in F by Hanns Hainlein, 1668—is no wider than that of the majority of tenors.[40]

Bell. The bell section is supported by a single bell stay, which is positioned well behind the connection with the slide, and will be described presently. Thus the bell projects freely from a point relatively far back, near its beginning, and it also continues much farther forward than that of a trombone, to fourth position rather than third.[41] The bell itself is quite small, as little as 9.3 or 9.4 cm in the earliest examples, and rarely more than 10.5 cm in narrow-bore sackbuts prior to the eighteenth century. Wörthmüller has observed that it was not until the end of that

[38] In the Jörg Neuschel 1557 tenor the outer slides are 14 mm in diameter; the tubing before the bell bow, as well as that of the bow itself, is 13.6 mm. In the Paul Hainlein 1653 tenor, the maximum diameter of the outer slides is 12.6 mm; the tubing leading to the bell bow is 11.8 mm, and that of the bell bow is 12 mm. I owe this information to detailed measurements supplied by Dr. Gerhard Stradner.

[39] The wide-bore tenor by Johann Leonhard Ehe II, after 1690 (Plenkers 1970, p. 56 and pl. 85 [1]) evidently has a more slender bell, although it terminates in a much larger flare. This also seems to be true of the tenor by Georg Ehe, 1619 (illustrated in Gregory 1973, pl. 1), less so in the case of the tenor by Cunrat Linczer, 1587, which again has a somewhat bulkier bell as well as a larger terminal diameter (illustrated by Young 1980, p. 43, no. 20).

[40] See Appendix I, D, No. 8. A photograph is to be seen in Gregory 1973, pl. 2.

[41] Most modern reproductions conform to the trombone in this respect—all, in fact, that do not faithfully copy a specific ancient model. The original extension of the bell has been observed in every tenor thus far where I have been able to verify its location precisely: e.g. Heyde 1980, pp. 170 (Joh. Leonhard I Ehe, 1668), 172 (Joh. Leonhard II Ehe, ca. 1724); also Anton Drewelwecz, 1595; Paul Hainlein, 1653; Jörg Neuschel, 1557 (a little short of fourth position); Hanns Geyer, Vienna, 1702.

century that it became appreciably larger.[42] The end of the bell is reinforced by a collar, the so-called garland (*Kranz*), bearing the maker's name, town and date, so engraved that it could be read from the player's end of the instrument. Although it was embellished with decorative borders such as seemingly massive scallop shells, these are hollow,[43] and the entire garland was made of very thin metal, attached only at the rim; it frequently stands slightly off the surface of the bell itself.[44]

Metal. The metal used for the instruments, normally brass,[45] contained variable proportions of copper, zinc and trace elements, but in many cases the proportion of 70% copper and 30% zinc was used, as is commonly done today.[46] The treatment of the metal was quite different from modern methods, however. Instead of using rolled metal and seamless tubing, the craftsman beat his brass ingots to the requisite degree of thinness—0.5 mm for the tubing, which was fashioned by hand. Like the tubing, the bell was also seamed, but joined in this case by a series of overlapping square tabs, a technique that goes back to the time of Tutankhamun.[47] Here the metal was hammered (on a mandrel) progressively thinner than the tubing that preceded it, down to as little as 0.2 mm as it neared the garland. The surface was then shaved still thinner, leaving longitudinal markings on the surface (Fig. 4), after which spinning was used to make the bell perfectly circular.[48] It should be added that the entire instrument was generally made of the same metal, including the inner slides; not only does one lack the advantage of another metal that might reduce friction, but there was only rarely—if ever—an enlargement at the ends of the inner slides that serves the same purpose in

[42] Wörthmüller 1954–55, p. 393. He lists only one example beyond the beginning of the century, however.

[43] As I saw for myself in examining the Jacob Bauer 1608 tenor while it was still dismembered in the Department of Musical Instruments of the Metropolitan Museum, before restoration.

[44] Cf. Wörthmüller 1954–55, p. 386.

[45] Galpin 1906, p. 12, notes the occasional use of silver in the Renaissance. In some cases, details such as the joints and stays were silver- or gold-plated, as attested by the Isaac Ehe bass of 1612 (Van der Meer 1979, p. 94).

[46] Geert Jan van der Heide (see Appendix II) has given me a list of analyses in which 7 of 15 ancient brass wind intruments contained 28 to 30% zinc; the rest varied from 10 to 22%. The proportion of 30% affords the maximum of elasticity in brass, and the maximum of elongation before fracture.

[47] Manniche 1976, p. 7 and pl. 10. For the method as practiced in more recent times, see Bate 1966, p. 188.

[48] I owe this description to Geert Jan van der Heide; he himself does not, however, conclude the process by spinning.

FIGURE 2

FIGURE 3

FIGURE 4

modern trombones (the so-called "stockings").[49] *E pur si muove*; "nonetheless, it moves."[50]

Assemblage. The assemblage of the Renaissance sackbut is particularly curious. Some of the earliest specimens have slide stays in the form of flat clamps that could be easily removed, held together by clasps in the form of dragons; the dragon-clasps rotate so that their heads fit into projecting slots. The Isaac Ehe 1612 bass offers an exceptionally ornate example, and shows how the clasps enable the clamps to open on their hinges, placed at either end (Fig. 5). The flat stays were eventually abandoned in favor of tubular ones, which appear already on the oldest sackbut known, that of Erasmus Schnitzer, 1551 (Fig. 6), although it is possible that they are a replacement of flat ones. Where tubular stays are used, the lower one, attached to the mobile portion of the slide, is segmented and telescopic, so that there is some outward (but no inward) play between the slides it connects.[51] The single stay in the bell section was always flat, and often elaborately embellished; the one on the tenor by Anton Drewelwecz, 1595, shows a hound pursuing a hare (Fig. 7). The scene is right side up from the point of view of the player; on the reverse, outer face it is inverted and must be viewed looking down from the bell bow. The stay was secured by a soldered sleeve at a point near the connection of the two main parts of the instrument,[52] while the other end was fastened more

[49] The existence of such exceptions is noted by Montagu 1979, p. 100; he does not identify them, nor, in response to an inquiry, has he been able to be more precise, the information having been received from someone else. As he recalls, however, the examples were said to be in Nuremberg. And Van der Meer 1979 does, in fact, describe two altos, one dated 1670, the other ca. 1700, the inner slides of which have an additional length of slightly wider tubing about 8 cm long (pp. 89–90, MIR 173, 177). In both cases he thinks the addition probably belongs to a later repair, although in that case the entire inner slide must be a replacement. Among the later trombones at Nuremberg, only one, dated ca. 1860, definitely has stockings (p. 97, MI 425). At the last minute, however, I have learned from Jean-Pierre Mathieu that stockings—in this case an extra thickness of metal soldered around the ends of the inner slides—are to be found in the Anton Schnitzer 1581 tenor (see Appendix I, B, No. 3). The craftsman who restored this instrument judged that they are of the same date as the slides themselves. It remains possible, of course, that the interior slides have been replaced in entirety, as in the case of the Jörg Neuschel tenor of 1557 (noted by Mag. Huber in the Kunsthistorisches Museum, Vienna).

[50] Indeed one can rely far more on the slide action than on the authenticity of these words ascribed to Galileo.

[51] Van der Meer 1979, p. 95, says the telescopic stay began to be discontinued at the end of the eighteenth century and is only occasionally attested down to 1860.

[52] As pointed out by van der Meer, *ibid.*, p. 89. Exceptional rigidity is needed at this point if the bell is to stay in place in relation to the slide.

FIGURE 5

loosely by a hinge with a removable pin, often made of wood or leather.[53]

The flatness of the bell stay, and its location quite far back from the stationary slide stay,[54] make it difficult, if not impossible, to put one's thumb around the former, as is done in holding a modern trombone, and from iconographic sources we know that the sackbut was, in fact, held only at the stationary slide stay.[55] This again means that the metal is more free to vibrate, and it hardly need be added that one should never encircle the bell with the left hand, as I have seen some otherwise compe-

[53] Van der Meer 1979, p. 95, says that the flat bell stay began to be replaced by a round one about 1840, but by that time the flat stay had long since ceased to be hinged.

[54] In the modern instrument the distance between the outermost points of these two stays is only 5.5 cm. In my Meinl & Lauber tenor (1976) it is 10 cm. In the Anton Drewelwecz tenor (1595) it is almost 12 cm.

[55] See Naylor 1979, pl. 22 and *passim*.

FIGURE 6

FIGURE 7

tent players do, for this mode of support inhibits vibration even more considerably. Such a procedure is quite contrary to the original intention —to say nothing of the strain it puts on the instrument.

Two pairs of joints secure the bows of the slide and bell sections, and another joint connects a short length of slightly expanded tubing with the smaller end of the bell. None of these joints is soldered, but each is sealed with beeswax. Within both bows there is a small eyelet, and Bate has convincingly suggested that these permitted a cord to be attached so as to

prevent any risk of the instrument coming apart at either end.[56] In the case of the bell bow the risk might be thought negligible until one reflects that the entire instrument must be turned virtually upside down to evacuate the accumulation of moisture and condensation, since no water key is provided.

The description of the joints that has just been given corresponds to Praetorius' drawing (Fig. 8) although Mersenne shows a different arrangement, with the tubing of the bell continued uninterruptedly through the bell bow, so that two joints are eliminated (Fig. 9). This anomaly was copied by Filippo Bonanni[57] and Giovanni Battista Martini,[58] but is not known to have any basis in reality.

Vibration of the metal. While two other questions remain to be discussed—that of tuning and the particularly difficult problem of mouthpieces—it should now be considered how the foregoing features are interrelated, with special attention to the thinness of metal in the bell. The fact that most tenor sackbuts are close to B flat, if played at the current standard of pitch, facilitates comparison with their modern counterparts. The moment we pick up the ancient instrument we are immediately impressed by its lightness and fragility. As already noted, the prevailing narrowness of the slide bore is continued in the slenderness of the bell and the small size of its opening. These characteristics in themselves make for a drier, softer sound, which is fully realized only by the very distinctive combination of two other factors: the preparation of the metal and the enhancement of vibration in the metal by every possible means. Richard A. Smith has determined that the material of a trumpet or trombone, and notably the bell, has little importance unless it is thin enough to be set in vibration.[59] Dr. Smith has established that a brass bell with a wall thickness of 0.3 mm vibrates twice as much as one with a thickness of 0.35 mm. He has not only plotted a curve to show that the degree of vibration is inversely proportional to the fourth power of thickness,[60] but has also

[56] Bate 1966, p. 77; (2nd ed., 1978, p. 84, where the text should read "string or thong").

[57] Bonanni 1723, pl. 5.

[58] *Storia della musica*, I, Bologna, 1757. See Naylor 1979, pl. 83, who likewise notes (p. 196) that it is based on Mersenne. All three pictures also show a crook at the juncture of slide and bell section, for adapting the tenor to a bass.

[59] Smith 1978, p. 28.

[60] *Ibid.*, p. 29.

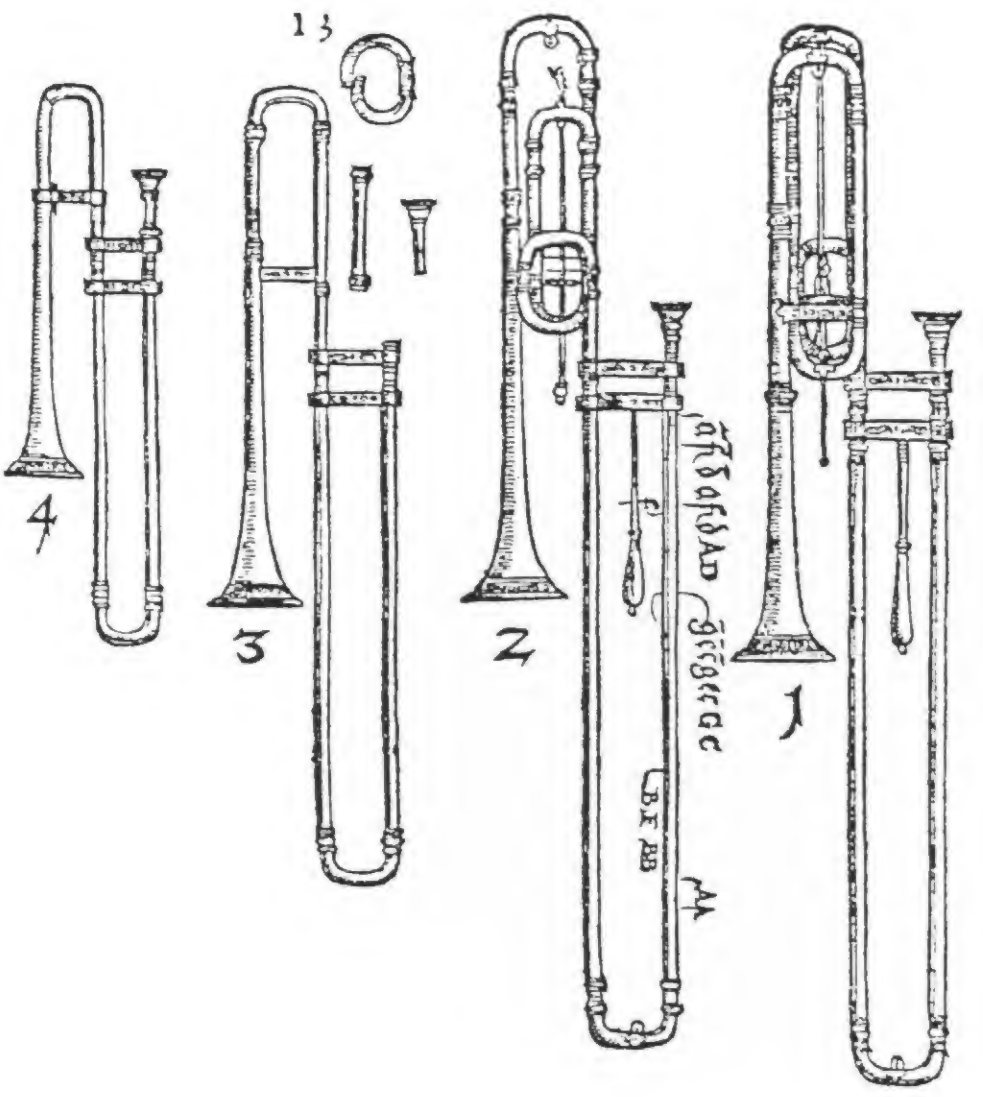


FIGURE 8

produced a holographic reconstruction of vibration in a modern trombone bell with a wall thickness of 0.3 mm (Fig. 10). One cannot help wondering, in viewing this photograph, whether the flow of vibration would not have gone much farther if it had not encountered the first of a series of rigid bell stays. The bell of the sackbut, with its much longer extension beyond the stay, avoids that impediment, especially since the stay is not rigidly attached. All the other loose connections likewise enhance some degree of vibration throughout the instrument, so much so

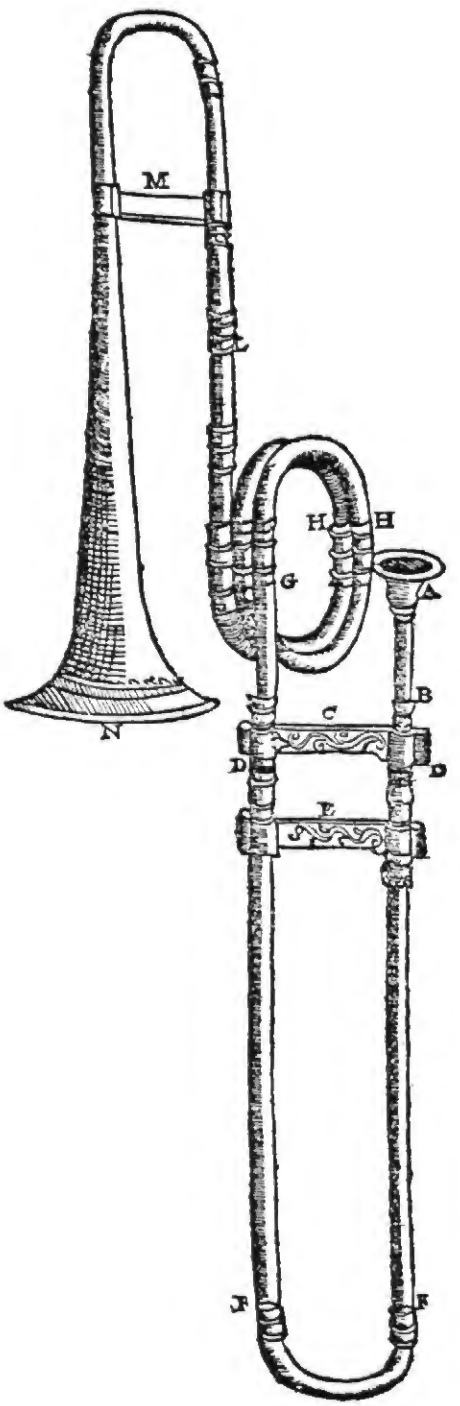


FIGURE 9

that it is difficult to believe they were primarily designed for ease in dismantling.[61] Since, as we shall see presently, the walls of sackbut bells were thinned down to even less than 0.3 mm, and since the resulting vibration was allowed as much freedom as possible, the use of beaten metal and the other old techniques that made for hardness and rigidity, are likewise free to have a very appreciable effect on the sound.

The extent to which the metal in the bell was progressively thinned down may be seen from the following measurements taken from the Georg Ehe 1619 tenor in Paris by Jacques Leguy, who has generously allowed me to present them here:

(1) Within inner edge of the garland	0.2 mm
13 cm from bell opening	0.25 mm
16 cm " " "	0.4 mm
17.5 cm " " "	0.3 mm
18.5 cm " " "	0.3 mm

There is every reason to think that the thinning down of the metal began at the small end of the bell and came down to 0.3 mm at about half the distance between this and the bell opening.[62] A sampling of data taken from other Nuremberg sackbuts show that a comparable degree of thinness was generally obtained at the same distance from the inner edge of the garland:

(2) Tenor, Erasmus Schnitzer, 1551	0.2 mm[63]
(3) Tenor, Anton Drewelwecz, 1595	0.18 mm
(4) Tenor, Jacob Bauer, 1608	0.23 mm[64]
(5) Bass, Isaac Ehe, 1612	0.28 mm
(6) Bass, Hanns Hainlein, 1668	0.2 mm[65]

[61] Bate 1966, p. 77 and n. 11, p. 81 (1978 ed., p. 83) concedes that the looseness of stays in early brasses must have arisen from a desire to enable the tube to vibrate more freely, but he condemns this idea as "wasteful of the player's energy." He nonetheless does not favor the alternative explanation as firmly as does Gregory 1973, p. 31; Gregory thinks the looseness of the stays and joints was intended to make it easier to dismantle the instrument for repair.

[62] Cf. n. 65 below and Thein 1981, p. 399, fig. 20.

[63] The data for Nos. 2, 3 and 5 have been supplied by Dr. John Henry van der Meer.

[64] Now in the collection of Dr. Robert Rosenbaum of Scarsdale, N.Y., who has obligingly provided this information.

[65] This information has been supplied by René de Maeyer, curator of the Museum of Musical Instruments in Brussels. He adds that the tubing is already hammered down to 0.4 mm thickness at the small end of the bell. Although Wörthmüller 1954–55, pp. 400–471, does not give specific

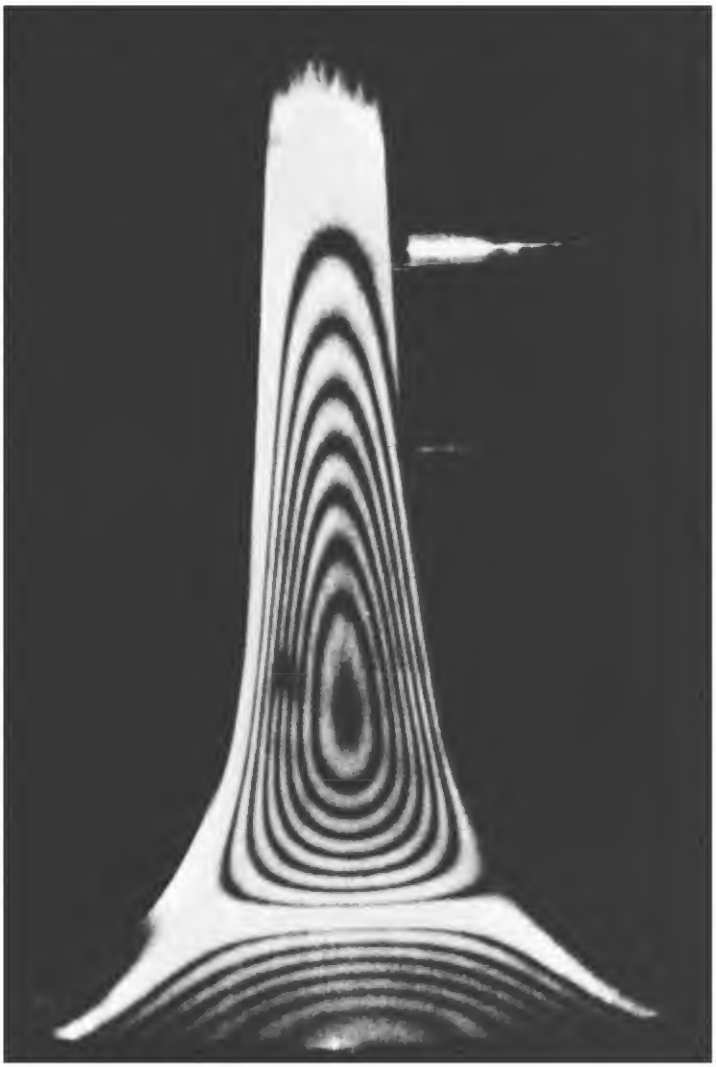


FIGURE 10

The bells of modern trombones, on the other hand, average 0.41 to 0.56 mm in the thickness of the walls,[66] although thinner bells are sometimes used. The aforementioned experiments of Dr. Smith have resulted in the adoption of a 0.3 mm thickness in the walls of the bell designed for Boosey

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data of this kind in describing the Nuremberg trumpets and trombones, the thinness of metal in the bell is duly noted (cf. n. 1).

[66] According to Robert Giardinelli, the proprietor of New York's largest store and repair shop specializing in band instruments.

& Hawkes' lightweight Sovereign 937, which is intended for small ensembles working in television studios rather than for symphony orchestras.

It will be recalled that early trumpets also had bells with very thin walls (n. 1 above). And Jacques Leguy has informed me that the same feature is to be found in the schalmei and alto shawm, which, although made of wood, have surprisingly thin bells (2 mm). He states, moreover, that: "Schalmeis with a thicker bell have a more aggressive and harder sound."

Tuning. Since the single bell stay is soldered at the base, and since the hinge at the other end is attached directly to the surface of the bell, it effectively holds the bell in place, preventing it from angling outward or inward upon the slide, as the loosely attached joints of the bell bow would otherwise permit it to do. Thus it would have been theoretically possible to equip the bell bow with tuning slides, as in the modern trombone.[67] That was never done, despite the fact that the brass sackbuts, in those cases where the bell section contains additional convolutions of tubing, were in fact equipped with a sliding bell bow that could alter pitch and tuning (Fig. 11).[68] In modern reproductions the tenor has sometimes been equipped with a very long coupling-stem that joins the two sections and that can be fixed in variously retracted or extended positions by means of a thumbscrew.[69] This expedient is anachronistic, but a crook or

[67] As is well demonstrated by the decorated model of the Finke tenor, which has tuning slides in the bell bow and is equipped with a single flat bell stay, hinged at the top.

[68] The simpler type of bass is exemplified by one in Brussels (Hanns Hainlein, 1668) and another in The Hague (Pierre Colbert, Rheims, 1593). The type with tuning bow is exemplified by the drawing in Praetorius (1619, II, pl. 8; my Fig. 8), as well as actual examples in Nuremberg (Isaac Ehe, 1612, illustrated in Fig. 11), Berlin (W. W. Haas, shown in Baines 1950, pl. 6[6]), Vienna (Johann Leonhard Ehe, 1732, shown in Gregory 1973, pl. 3), and Leipzig (Hanns Hainlein, 1631, *ibid.*, pl. 2). The bass in E♭ of Hanns Hainlein, 1631, can be lengthened a half step down to D (Heyde 1980, p. 189); that of Isaac Ehe, 1612, can be lengthened a full step down, from E♭ to D♭ (Van der Meer 1979, p. 94). One advantage of these changes, generally overlooked, lies in the fact that the bass lacked a seventh position, so that one note—often an important one—was lacking; with two or more alternative pitches at his disposal, the player could decide, before beginning a particular piece, which of these notes could be sacrificed and which were required (cf. note 146 below).

[69] As on all Meinl & Lauber altos and tenors until 1980, when tuning slides were introduced. Richard Cook also offers this arrangement, although tuning bits are alternatively possible. Alexander, Böhm & Meinl, and W. Monke use the thumbscrew even though a tuning slide is provided.

FIGURE 11

straight extension was sometimes inserted at the same point,[70] and it seems possible that some use was made of "bits"—a series of short tapered tubes of varying length, which were inserted between the mouthpiece and the slide. These "bits" were used down to the end of the last century,[71] and their convenience suggests that they may have been employed as early as the Renaissance. There is no corroborative evidence, however, beyond the fact that an extension was sometimes added to the mouthpiece of trumpets.[72] The chief practical drawback is that if several of them are combined, the player needs a particularly long arm to reach seventh position. In the bass sackbut, with its very long slide, this problem is necessarily solved by providing a lever that extends the player's reach, even though, as in the case of the altos, there are only six positions. There is some evidence that tenors, too, were occasionally equipped with such levers for persons with short arms.[73]

Both Baines and Guion have interpreted a passage in Praetorius' *Syntagma Musicum* as indicating that the tenor sackbut had a floating first position, with the slide drawn slightly outward. As Guion translates it, Praetorius says:

I humbly believe that there is no better instrument for finding correct pitch than a trombone—especially those formerly and presently made at Nuremberg—for

[70] As shown, for example, in the illustration from Praetorius 1619, II, my Fig. 8.

[71] Bate 1966, pp. 71–72 (2nd ed., 1978, p. 79). Don L. Smithers, *The Music and History of the Baroque Trumpet before 1721* (London, 1973), p. 26, indicates that these *Setzstücken* were used for tuning as early as the Renaissance. In response to an inquiry on this point, he has referred to Praetorius 1619, II, p. 32, where it is also stated that an accomplished player could adjust tuning by means of his embouchure and mouthpiece. Praetorius does not make it clear, however, either here or in his plate (my Fig. 8), whether the *Setzstück* went between mouthpiece and slide or between slide and bell section. And he makes no mention of this element in connection with trumpets.

[72] Peter Downey, *Early Music* 12 (1984), 26–33, argues that this was always a fixed extension and never a slide, so far as Renaissance instruments are concerned.

[73] An apparent representation of one (interpreted as a bass by Kenton 1957, 78) is shown in the well-known picture of Orlando di Lasso and his ensemble by Hans Mielich (shown in *The New Grove Dictionary*, X, p. 488). An actual example by Hanns Geyer, Vienna, 1676, has been described by Wessley 1952, p. 34 (106): "Tenorposaune mit Zughandhabe ('Anstoss'). . . . " As seen from photographs obtained recently, the lever is not actually present, but was evidently deduced from the structure of the stay on the movable slide (Fig. 12). Another tenor of the same date and provenance (no. 107) has a normal slide stay. A very short lever is to be seen on the tenor of Hanns Leonhard Ehe, Sr., 1668 (Heyde 1980, pl. 24, no. 1896), but this may be a later addition; note that the bell stay has been replaced by a tubular one, and the bell has been modified (*ibid.*, p. 171).

FIGURE 12

if one extends the slide [about] the width of two fingers [umb 2. Finger breit vom ende], it gives in true choir pitch, exactly the right and proper tenor a.[74]

The "two fingers" are taken to correspond to a quarter tone, or 4 cm, and Guion goes considerably further than Baines in asserting that such an extension was needed because tuning slides were not available.[75] This means of tuning would not, in any case, have been available for the higher "Cornett-ton," however, assuming that Baines is right in making his distinction in pitch.[76] And in at least some cases such an extension was virtually impossible even where it might easily have been provided. The Anton Drewelwecz 1595 tenor, made in Nuremberg, has inner slides 62.3

[74] Guion 1980, p. 25, quoting from Vol. II, p. 232; the original text is given in n. 25. Guion apparently does not make Baines' distinction of pitches. And it must be acknowledged that the definition of pitches in Praetorius 1619, II, pp. 14–16, is not at all clear. In one passage (p. 232) he seems to use "choral pitch" in the sense generally accepted by his contemporaries, rather than in the sense he would perfer (a choral pitch that is a whole tone lower than that which he would call "chamber pitch"). He mentions a tendency to raise the accepted pitch a semitone higher, which might conceivably correspond to "cornetto pitch," but this last term is not named as such.

[75] *Ibid.*, p. 26. Baines 1976, p. 115, concedes that the player may have inserted a shank between slide and bell if he found this more satisfactory.

[76] See p. 4 above.

cm long, about 5 cm longer than seventh position, and that length of 5 cm is needed to keep the slide steady when fully extended. The inner slides stop about 4 cm short of the joint at the bottom of the outer slide, suggesting that they might have been lengthened if that was desired.[77] Apart from these considerations, it should be noted that Praetorius does not imply that the suggested two-finger extension was intended to enable the sackbut to adjust to the pitch of other instruments, but, conversely, that it was intended to give the correct pitch to others. Nor does he make any reference to the slide in his comments on tuning (n. 71 above). And finally there is no basis for distinguishing between the "2. Finger breit," as specified by Praetorius and "zwey quer Finger," which Speer applies to a half step,[78] and this equation supports the idea, mentioned earlier (p. 6) that Praetorius' conception of the tenor positions was in B flat—at least as far as choir pitch was concerned.[79]

Mouthpiece. The mouthpiece presents a most difficult problem, and particularly where the tenor sackbut is concerned. Many of the surviving instruments have no mouthpiece at all, and if they do, it is often a relatively recent replacement. To make matters worse, these small appurtenances, however important their function, were rarely labeled or identified. An exception is offered by Anthony Baines, who gives both a draw-

[77] As Geert Jan van der Heide has observed to me, however, a certain amount of space would be taken up by such an extension, the external diameter of the inner slide being appreciably less than the internal diameter of the outer one, leaving about 0.75 mm between them. A further slight adjustment might therefore be necessary.

[78] I have to thank my friend Dr. Helmut Nickel, Curator of Arms and Armor at the Metropolitan Museum of Art, for confirming my suspicions on this point. Perhaps it should also be noted that Praetorius uses a period after cardinal figures as well as ordinals (e.g., p. 142 of the same work). Mersenne 1636, p. 342, also uses "four fingers distance" [quatre doigts] exactly as Speer does, referring to the length of two modern positions (between g in first position and f below it; cf. n. 23 above). Here it may be added that Heyde 1980, p. 13, seems to agree with Baines that the "two fingers" of Praetorius are a lesser measure, for in citing the passage in question he says the slide is extended this much in sounding middle b flat. (He evidently does not accept the idea of the A-positions.) The same idea is apparent from his conclusions concerning pitch. Perhaps it originated with Mendel 1948, p. 201. My own interpretation of the two-finger interval suggests that the A positions may have been used for "cornetto pitch" and the B flat positions for "choir pitch"; this would agree with Gregory's view (1973, p. 34) that the "cornetto pitch" was a semitone higher than the other.

[79] This would, however, still be higher than the choir pitch of Praetorius as defined by Mark Lindley et al., in *The New Grove Dictionary*, XIV, p. 782: "a significant portion of a semitone lower than a′ = 440." The passage in question is not mentioned in this article.

ing and the dimensions of a mouthpiece almost certainly belonging to a tenor by Anton Schnitzer, Jr., 1579, which "is engraved NURNBERG and matches the instrument in decoration"; the cup is said to have a depth of 13.9 mm and a throat 8.2 mm in diameter.[80] But according to the new catalogue of the Verona Accademia Filarmonica, by John Henry van der Meer and Rainer Weber, the purported tenor is actually a bass, and the depth of the cup is 17.9 mm rather than 13.9 mm, as Baines says.[81] Baines gives other measurements for bass mouthpieces in which the throat is relatively large (8 mm, and in one case as much as 9 mm) and where the cup is relatively deep (ca. 18 to 20 mm).[82] He rightly speaks of the sackbut mouthpieces as having flat rims and sharply defined throats (features that persisted into the mid-nineteenth century),[83] but errs in saying that they all had wide throats. His one example of an alto with a throat of 8 mm width is described differently by Wörthmüller as having a throat 6.3 mm wide, and it seems in any case to be suspect.[84] A drawing of another example in the same collection is shown in Fig. 13.

Thanks to information received from Jean-Pierre Mathieu, trombonist and member of the faculty of the Conservatoire National de Région de Toulouse,[85] I have learned that a B flat tenor by Anton Schnitzer, 1581, not only has an ancient mouthpiece, but one that bears the mark (probably the house mark) of the Schnitzer family, accompanied by the inscription "NURMB." The same house mark appears on the bell of the sackbut itself, as well as on a bass sackbut inscribed by a later member of the Schnitzer family: Jobst Schnitzer, 1612.[86] It is therefore certain that the mouthpiece and the sackbut to which it is attached both came from

[80] Baines 1976, p. 113; drawing on p. 105, fig. 16 (right).

[81] Van der Meer & Weber 1982, p. 74; pl. on p. 128.

[82] Baines 1976, p. 113.

[83] According to Van der Meer 1979, p. 96.

[84] Wörthmüller 1954–55, p. 407, gives similar figures for all the measurements but this one, which he considers an exceptionally large bore; the maximum width is also noted as being uncommonly large. The authenticity (or contemporaneity) of all the mouthpieces in the Nuremberg collection was reviewed in about 1973, and it is evident that this example was rejected and replaced by another, described by Van der Meer 1979, p. 90 (MI 314).

[85] Fourtet & Mathieu 1979. Mathieu has supplied me with photocopies of some of the pages that concern the instrument in question.

[86] Heyde 1980, pp. 183 (no. 1908) and 249. I owe the suggestion that this is a house emblem to Helmut Nickel, who plausibly suggests that the three triangles may represent chips of wood (*Schnitzel*) alluding to the family name, which means "woodcarver."

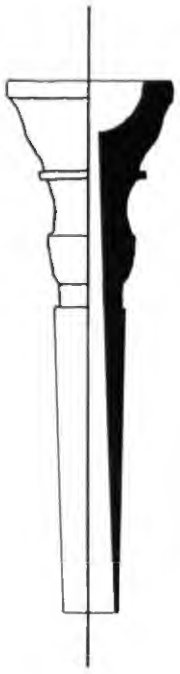


FIGURE 13

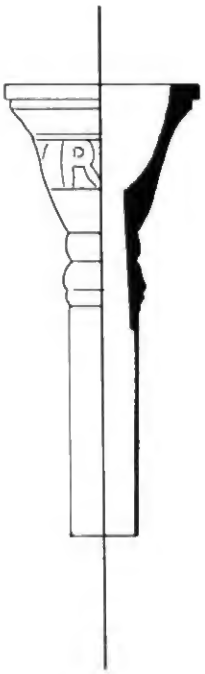


FIGURE 14

FIGURE 15a

FIGURE 15b

FIGURE 15c

the same workshop. It was made in two pieces, the cup and shank being united by a collar. The walls of the cup are slightly concave, and the throat—like that of all other sackbut mouthpieces with any claim to antiquity—is sharp-edged. The lip is flat, the edges beveled no more than 0.5 mm, or even less, to judge from the photographs and from casts supplied by Michel Foussard, curator of the Musée du Conservatoire National de Région de Nice. Thanks to his careful measurements and casts, I have been able to produce a reasonably accurate drawing (Fig. 14), which may be compared with some details of the exterior, supplied by Mathieu (Fig. 15).

Combining this specimen with apparently authentic examples of mouthpieces for an e flat alto and a bass, one may make the following comparison:

Alto by Hieronimus Starck, 1670 (Nuremberg, Nationalmuseum MI 173; Fig. 13):

max. diam. 2.68 cm; inner diam. of cup 1.72 cm; throat 3.6 mm; depth of cup 8.1 mm.[87]

Tenor by Anton Schnitzer, 1581 (Nice, Musée du Conservatoire; Fig. 14):

max. diam. 3.0 cm; inner diam. of cup 2.2 cm; throat 6.7 mm; depth of cup 17 mm.

Bass by Isaac Ehe, 1616 (Munich, Bayerisches Nationalmuseum):

max. diam. 4.3 cm; inner diam. of cup 2.8 cm; throat 8 mm; depth of cup 20 mm.[88]

Obviously, so small a sampling does not take into account all the variations and individual preferences that must have existed, but we can at least be sure of the predominance of the flat rim, which helps to dampen the sound, and of the sharp-edged throat, which contributes to its dryness. It is also fairly certain that the cup was progressively deeper in the case of the tenor and bass, and the throat was progressively larger. According to van der Meer, the alto mouthpiece was, in contrast to these two, more shallow, almost as much so as that of the trumpet.[89]

[87] Van der Meer 1979, p. 90. Fairly similar measurements are given for the alto by Wolfgang Birkholtz, 1695 (*loc. cit.*); see n. 84 above.

[88] Baines 1976, p. 113.

[89] Van der Meer 1979, p. 89.

FIGURE 16

Decoration. All of the connecting joints on the tubing were normally embellished with engraved decoration, as were the flat stay in the bell section and the stays on the slides (whether flat or tubular).[90] As noted

[90] For the repertory of the decoration, see Wörthmüller 1954–55, pl. 6, and especially Heyde 1980, pp. 248–257; 259–263.

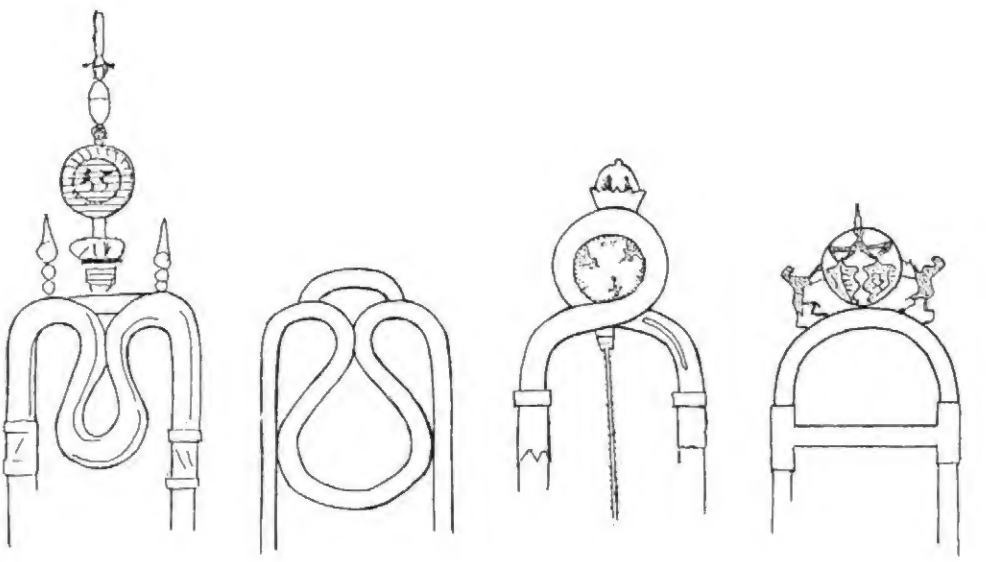


FIGURE 17

earlier, particular attention was often given to the garland on the bell, the edge of which was reinforced by a ring that frequently imitates braiding,[91] and is simply soldered onto the surface (Fig. 16).[92] This is analogous to the reinforcing wire at the edge of modern trombone bells, but in the case of the modern trombone the edge of the bell is rolled up and over the ring, concealing it completely.

Although there is scarcely any evidence for the attachment of banners, or other such trappings,[93] a certain amount of additional adornment was occasionally applied to the bell bow, as shown in Fig. 17 (sketches not drawn to the same scale). The first two examples are on octave basses, one reproduced by Praetorius,[94] the other by George Nickolaus Oller, Stockholm, 1639;[95] the third is the bass in E flat by Isaac Ehe, 1612;[96] and the last is the wide-bore tenor by George Ehe, 1619.[97]

[91] Cf. Heyde 1980, pp. 256–257.

[92] Bell of tenor of Sebastian Hainlein, Jr., 1642; see Appendix I, B, No. 8.

[93] An exception is to be found in an engraving by Heinrich Aldegrever, 1538 (Naylor 1979, pl. 22).

[94] Praetorius 1619, II, pl. 6.

[95] Gregory 1973, pl. 4, described pp. 34–35.

[96] See Appendix I, D, No. 3.

[97] See Appendix I, C, No. 3.

III

The Search for a Satisfactory Reproduction

HAVING HEARD that Meinl & Lauber had the best reputation in the field, and knowing little else about the subject, I felt fortunate in beginning, in 1980, with a secondhand tenor that I could afford. It proved to be the "Hainlein model," with a bore of 11.5–12.0 mm and a 12.0–cm bell opening. Made in 1976, it has a beautifully decorated garland with a fringe of scallop shells, and the slide action is excellent. Unfortunately, however, its sound is not much different from that of a trombone, apart from being somewhat lessened in volume. I then came to realize, from information provided by Jaques Leguy, that the Georg Ehe tenor in Paris was not only very light—as I could observe when I handled it in the fall of 1981—but was remarkably so in the bell, the walls of which were thinned down to 0.2 mm. His data led me to inquire whether comparable measurements applied to other Renaissance brasses. It was soon apparent from my inquiries, as well as from Wörthmüller's dissertation, that this was indeed the case, whereas the bell of my Meinl & Lauber tenor had walls about 0.5 mm thick, just as do most other modern reproductions. Leguy reasoned that the very much reduced thickness of the ancient sackbut "enables the instrument to be considered as an acoustical filter for low frequencies, the energy of which is mechanically absorbed by vibrations of the metal itself." I therefore considered it likely that the factor in question might be largely responsible for the softness of volume, and even for the general quality of sound, of the Renaissance sackbut. That persuasive conclusion remained to be tested, however.

An opportunity for such a test presented itself when Richard Cook announced, in April 1982, that he was ready to offer a tenor manufactured by Ronald Collier in Chicago, and patterned on the wide-bore model of the Meinl & Lauber sackbut, but providing for much greater

FIGURE 18

thinness in the walls of the bell. Although their original intention was to thin the bell to 0.35 mm, I persuaded them, armed with the data I had collected, to reduce it to less than 0.3 mm (thus doubling the vibration). I also persuaded them to keep the garland slightly off the surface, except at the rim where it was attached, and to loosen the bell stay. There were several other suggestions, too, including the option of having a set of tuning bits instead of the Meinl & Lauber method of using an extendable shank for tuning between the slide and bell section. The important point, however, was the degree of vibration, which was now quite pronounced, and the result was a definite improvement. Despite these modifications, and much to my disappointment, they were not at all sufficient, though, to recapture the sound of the original sackbuts.

Somewhat better results were obtained in 1983 by taking a narrow-bore (10 mm) tenor by Wilhelm Monke and having Mr. Collier spin down the thickness of metal in the bell from 0.5 mm to an average of 0.238 mm, the thinnest portion being 0.178 mm over a length of 12 cm to the bell opening. The thinning-down of the bell was combined with some other changes, including the removal of a superfluous bell stay just behind the juncture of the two parts of the instrument and the introduction of a telescopic insert in the next bell stay (Fig. 18). The stay would then continue to hold the bell in place, but would allow for vibration at the upper end, as did the hinged bell stays of the Renaissance. The result in this case was a somewhat drier and softer sound. The narrow bore, in combination with a very thin bell, curiously seemed to have a greater effect, as compared to modern wide-bore reproductions, than is true of ancient sackbuts of narrower and wider bore; nonetheless, the sound still

fell considerably short of the goal. That meant that the missing ingredient had to be sought in the material itself and the way it was prepared, for it will be recalled that these factors become effective once the metal is free to vibrate.

Having pursued my quest so far, I finally ordered a considerably more expensive tenor sackbut from Geert Jan van der Heide of Putten, east of Amsterdam, of whom Jacques Leguy had informed me. Although his normal waiting period for orders is one to two years, he generously produced one for me in six months so that I could report on it in this publication. His aim is to create a literal reproduction of a specific instrument, in this case the tenor of Anton Drewelwecz, 1595—an excellent choice, as I know from having tried the original in Nuremberg (Fig. 19). He begins with sheets of brass 2 mm thick and hammers them down to 0.5 mm for the tubing. The bell begins with a wall thickness of 0.5 mm and comes down to 0.3 mm about 7 cm from the bell opening, then down to 0.25 mm just before the garland. The joints on the slide and bell bows are secured with beeswax. Despite the fact that the thinning of the metal does not come down to 0.3 mm through as great a length of the bell as it should, and that the garland (extremely thin in this case) is tightly pressed against the surface, the resulting sound is very much closer to the ancient model than any other reproduction I have tried thus far. So much closer, in fact, that all those other reproductions seem unsatisfactory by comparison. Some improvement has subsequently been made by Ronald Collier, who has thinned the walls of the bell a little more by further planing and the use of abrasives; the resultant increase in vibration has been enhanced by tapering the wooden pin that secures the hinge on the bell stay, so as to loosen the connection. The absence of shock absorbers at the top of the slides tends to cause an occasionally annoying clicking, but this can be avoided merely by introducing a loop of thin string, which can easily be replaced from time to time.

It is possible that an equally noteworthy exception is to be found in the work of Heinrich and Max Thein, who also make exact reproductions, but do a great deal more hammering in the preparation of their brass. In their case they begin with specially prepared ingots of 20-mm thickness, hammering the metal into 0.5-mm sheets. The metal at the end of the bell is hammered down to as little as 0.1 mm, and it evidently becomes 0.3 mm at about the halfway point. Although they particularly

FIGURE 19

promote a reproduction of the wide-bore Jörg Neuschel sackbut,[98] numerous other choices are available. Their prices are considerably higher than those of van der Heide, and I cannot say whether that difference is justified by their workmanship (of which more will be said later) or by an even greater authenticity of tone.

It is extremely easy to play van der Heide's instrument softly,[99] although the notes are articulated with less facility, and I find, too, that some practice has been required to accustom myself to the different position of the bell, especially since I sometimes play a tenor trombone that has the bell in the modern position. The higher price and the extra effort are both well justified, however, if one is really serious about recapturing the antique sackbut sound. And there is the advantage mentioned by Richard Taruskin in a recent article on authenticity: "The unfamiliarity of the instrument forces mind, hand and ear out of their familiar routines and into more direct confrontation with the music."[100]

It might be worth experimenting, in order to hold the price down, with a compromise in which seamless tubing (of appropriately narrow bore) would be combined with a bell made of hand-beaten brass, the walls of which were reduced to the proper degree of thinness.[101] If this were done, the joints, stays, and all dimensions should closely follow a specific museum piece, with the bell extending to fourth position.

One small matter that has not yet been dealt with, is the question of lacquer. No such protective coating was applied to Renaissance sackbuts, and no one seems thus far to have studied the effects of such a coating on the vibration of thin-walled bells, but it seems certain that vibration would be inhibited to some extent. Lacquer is therefore to be avoided whenever the proper degree of vibration is sought. To lessen the amount of polishing that consequently must be done, I suggest the use of white cotton gloves for practice and rehearsals.

[98] This reproduction is described by Thein 1981. Information on the thinness of the bell is given on p. 399.

[99] Speer 1687/97, p. 221, notes: " . . . this instrument requires no particular strength of body; on the contrary, it can be learned, as far as physical strength is concerned, quite readily by a youth of eight, nine, or ten years—especially a bass or tenor sackbut, which requires quite little breath" [*gar schlechten Wind*].

[100] *Early Music* 12 (1984), p. 11.

[101] George McCracken, a brass instrument maker who hopes to make sackbuts in the near future, has expressed interest in taking up my suggestion. His address is Box 28, Williamsburg, Va. 23185. Ronald Collier (see Appendix II, 3) has also responded positively, and may be able to offer a relatively inexpensive model in the near future.

IV

Conclusion

My experience has been discouraging to the extent that it shows there is no easy and inexpensive way of faithfully reproducing the sound of the Renaissance sackbut. But it is even more discouraging that American players have virtually ignored this important question, as is demonstrated by the fact that they have almost always preferred the wider-bore tenor of Meinl & Lauber to their narrow-bore model. A representative of Meinl & Lauber has informed me by letter that that is the case, and I suspect that the same popular preference has prompted the Thein brothers to promote the Jörg Neuschel tenor.[102] Mr. Anton Alexander, the well-known manufacturer of wind instruments, is rather inclined to ascribe this preference to the limitations of amateurs; he writes that the bore of his sackbuts "is a little bit wider [11.8 mm in the case of the tenor!] in order to make the instruments easier to play for non-professional musicians." At the moment it seems, whatever the reason, virtually impossible to obtain a moderately priced sackbut with a bore of less than 11 mm. The only two available tenors that are narrower (including the one by W. Monke described earlier) have several notes out of tune. The narrow-bore "Drewelwecz model" of Ewald Meinl is doubtless more reliable, but it is not sufficiently authentic to warrant its very high price.

It is true that there seems to be increased interest, since 1981, in using mouthpieces of greater authenticity, and that is at least one step in the right direction. Richard Cook and Ronald Collier have taken special care in this respect, and in addition have taken another step forward in pro-

[102] Another reason is given, however, in Thein 1981; here it is misleadingly stated that the Neuschel tenor has a wide bore in contrast to later sackbuts (p. 377), and that this feature is characteristic of the Renaissance as opposed to the Baroque period, which favored narrower bores (p. 393). Lane 1982, pp. 40–41, implies, with equal lack of justification, the reverse of Thein's opinion: that the sackbut had a narrower bore prior to innovations by Neuschel in the sixteenth century.

viding for the correct degree of thinness in the walls of the bell. Furthermore, providing that they receive the amount of encouragement they deserve, they hope to make a much greater advance in the near future—a replica of the narrow-bore Jacob Bauer 1608 tenor with a hand-beaten bell and hand-rolled tubing. I learned of this development while telling Mr. Cook of the idea expressed at the end of the preceding chapter. It seems likely, however, that its cost will exceed that of van der Heide's tenor, although the normal waiting period may be less.

It is, of course, quite possible to play the usual reproductions softly—just as, for that matter, one can play a trombone softly—but the ancient sackbuts do this naturally and to a greater degree, combined with a distinctive dryness of tone, particularly in the upper register, that is completely devoid of either the unctuous or brassy qualities that one commonly hears on the trombone.

It seems symptomatic of the currently prevalent use of modern sackbuts, that they, along with cornetti are sometimes pitted against softer viols in playing music such as that of Giovanni Gabrieli.[103] As Clifford Bartlett and Peter Holman have pointed out,[104] there is evidence that Gabrieli's instrumental choirs had similar, rather than contrasted scoring. Conversely, there seems to be no evidence that he used dynamic contrast between the choirs. Although Bartlett and Holman do not specifically mention it in this connection, even Gabrieli's famous Sonata Pian e Forte à 8 is a case in point: There are two choirs—one with a cornetto and three sackbuts, the other with a viola and three sackbuts—and the loud and soft passages are taken by both.[105]

The prevalent misunderstanding is that sackbuts are assumed to be louder than viols, and therefore to be contrasted with them, whereas they can and should be able to play together in dulcet compatibility. Although the existing evidence for Renaissance orchestration is meager, it is sufficient to show that sackbuts were in fact combined with them, along with other soft instruments such as recorders and, of course, with voices.[106]

[103] As I have heard in concerts in New York City. Ehmann 1958, p. 220, describes a similar case, where a choir of brasses was set against a choir of recorders.

[104] Bartlett & Holman 1975, p. 27, and the tabulations on pp. 30–31.

[105] Most conveniently available in the Musica Rara edition, London: MR 1545.

[106] See Galpin 1906, p. 12; Dart 1954, pp. 140–141; Kenton 1957, pp. 76–78; Monk 1961, p. 285.

Appendix I

SOME ALTOS, TENORS, AND BASSES, WITH BORE AND BELL DIAMETERS

Wörthmüller gives information on bell diameters but not on the bore of the inner slides,[107] and this information is also frequently lacking in museum catalogues. I have therefore had to rely on the good will of many curators in compiling the sampling that follows. The most illuminating response has come from Vienna; if all museums recorded the measurements of their sackbuts as clearly and fully as the Kunsthistorisches Museum, all sorts of interesting comparisons could readily be made. A single example from their records (Fig. 20), by Mag. Alfons Huber, may well serve as a model for future catalogues, and I am indebted to Dr. Gerhard Stradner for his permission to reproduce it here.

If the number of tenor instruments seems disproportionately large, that is partly because more of them do in fact survive, and partly because I have been especially interested in the relative incidence of narrower and wider bores among this most popular of the three principal sizes of Renaissance sackbuts. All the instruments are by Nuremberg craftsmen unless another locality is given. All in the collection at Nuremberg and Leipzig are illustrated by Van der Meer 1979 and Heyde 1980; some of the others are illustrated elsewhere, as cited in the footnotes.

A. ALTOS (ALL E FLAT UNLESS OTHERWISE SPECIFIED)

1. Michael Nagel, 1656: bore 11.4–11.9 mm; bell 9.5 cm[108]
2. Hieronimus Starck, 1670: bore 9.4–10.2 mm; bell 9.6 cm[109]

[107] There is an entry for "Mensur" in each case, but the first such entry (p. 402) shows that the first figure is the inner diameter at the entry of the mouthpiece, while the second is just before the widening of the bell.

[108] Information kindly provided by Dr. Manfred Hermann Schmid, Direktor, Musikinstrumentenmuseum, Munich. The instrument is mistakenly described by Wörthmüller 1954–55, p.457, as a tenor in C.

[109] All information from Geert Jan van der Heide.

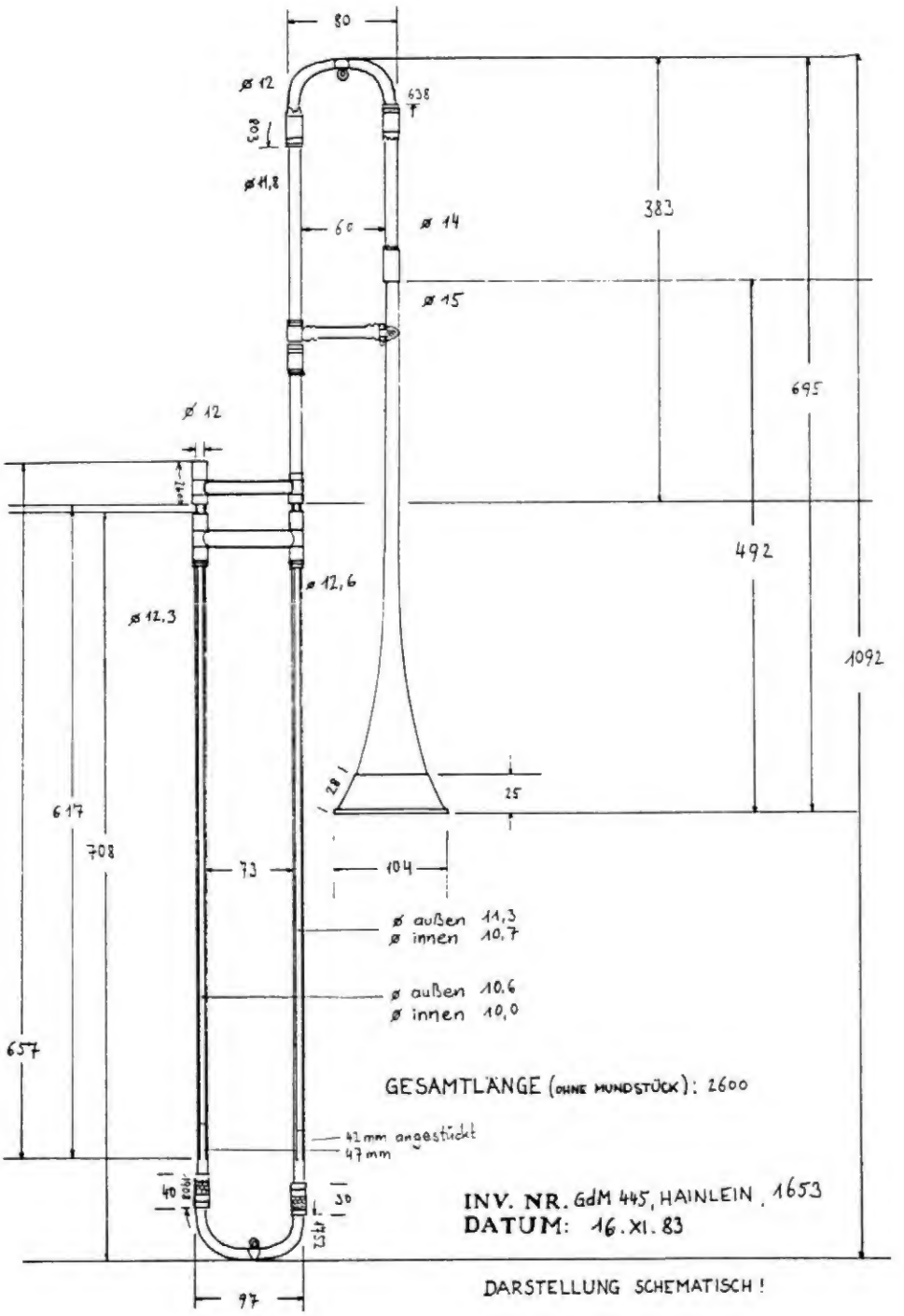

80
ø 12
638
603
ø 11,8
60
ø 14
383
ø 15
695
ø 12
492
ø 12,6
ø 12,3
1092
617
708
73
104
ø außen 11,3
ø innen 10,7
ø außen 10,6
ø innen 10,0
657
GESAMTLÄNGE (OHNE MUNDSTÜCK): 2600
42 mm angestückt
47 mm
40
30
452
INV. NR. GdM 445, HAINLEIN, 1653
DATUM: 16.XI.83
97
DARSTELLUNG SCHEMATISCH!

FIGURE 20

3. Hieronimus Starck, 1690: bore 9.9 mm; bell 9.85 cm[110] (pitch e natural)
4. Wolfgang Birckholtz, 1695: bore 9.5 mm; bell 10.1 cm[111]
5. Hanns Geyer, Vienna, 1702, bore 10.2 mm; bell 11 cm[112]

B. NARROW-BORE TENORS (ALL B FLAT UNLESS OTHERWISE SPECIFIED)

1. Erasmus Schnitzer, 1551: bore 10 mm; bell 9.4 cm[113] (see Figs. 4 and 6 above)
2. Anonymous, Venice(?), ca. 1560: bore 9 mm; bell 9.3 cm[114]
3. Anton Schnitzer, 1581: bore 10 mm; bell 10 cm[115]
4. Anton Drewelwecz, 1595: bore 10 mm; bell 10.3 cm[116] (see Figs. 7 and 19 above)
5. Jakob Bauer, 1608: bore 10.2–10.4 mm; bell 11 cm[117]
6. Sebastian Hainlein, Jr., 1631: bore 10.2–10.5 mm; bell 10.2 cm[118]
7. Hanns Doll, 1638: bore 10.2 mm; bell 10.6 cm[119]
8. Sebastian Hainlein, Jr., 1642: bore 10 mm; bell 10.5 cm[120]
9. Rudolf Veit, Naumburg, ca. 1650: bore 10.4 mm (only slide preserved)[121]
10. Paul Hainlein, 1653: bore 10–10.7 mm; bell 10.4 cm[122] (see Fig. 2 above)
11. Hanns Leonhard Ehe, Sr., 1668: bore 10 mm; bell 10.5 cm (pitch B natural)[123]

[110] Heyde 1980, pp. 163–164: "E-Grösse, $a^1 = 443$ Hz."

[111] Van der Meer 1979, p. 90; I also owe the bore measurement to Dr. van der Meer.

[112] I owe these data to Dr. Katalin Körmöczi, Deputy Head of Department, Magyar Nemzeti Múzeum, Budapest. Cf. Gábry 1976, p. 30, and plate showing no. 55.

[113] Van der Meer 1979, p. 91. Dr. van der Meer has also supplied the bore measurements.

[114] Van der Meer & Weber 1982, p. 71. Dr. Enrico Paganuzzi, Librarian of the Accademia Filarmonica di Verona, has supplied me with the bore measurement.

[115] See n. 85 above.

[116] Van der Meer 1976, p. 92; Geert Jan van der Heide has supplied the bore measurement.

[117] In the possession of Dr. Robert Rosenbaum of Scarsdale, New York, who has given me the diameter of the bell opening. The bore measurements were made by Stewart Pollens, restorer in the Metropolitan Museum's Department of Musical Instruments. Illustrated by Gary M. Stewart in *Journal of the American Musical Instrument Society* 8 (1982), 81 ff.

[118] Data taken from a list of ancient models issued by Max & Heinrich Thein in 1982. According to the date, this seems to be the instrument in Frankfurt am Main; cf. Wörthmüller 1954–55, p. 445.

[119] Seifers 1976, p. 72. Illustrated in the handbook *Deutsches Museum von Meisterwerken der Naturwissenschaft und Technik. Musik: Objekt- und Demonstrationsverzeichnis*, Munich, 1976, p. 145.

[120] Van der Meer 1976, p. 92; Dr. van der Meer has also supplied the bore measurement.

[121] Krickeberg & Rauch 1976, p. 187.

[122] Information supplied by Dr. Gerhard Stradner, Director of the Musical Instrument Collection, Kunsthistorisches Museum, Vienna, from measurements made by Mag. Alfons Huber.

[123] Heyde 1980, pp. 16, 170. The pitch has evidently been raised by shortening the length of the air column about 5 cm, almost a third of a modern position (*ibid.*, p. 171).

12. Anonymous, Vienna(?), captured (or recaptured) from the Turks in 1683: bore 10–11 mm; bell 10.3 cm[124]
13–14. Hanns Geyer, Vienna, 1676: bore 10 mm; bell 10 cm (two almost identical instruments, one formerly fitted with a lever for the slide, like a bass)[125]
15. Hanns Geyer, Vienna, 1702: bore 10.4 mm; bell 11.2 cm[126]
16. Johann Carl Kodisch, 1721: bore ca. 10.3 mm; bell 12.3–12.5 cm[127]

C. LARGE-BORE TENORS (ALL B FLAT)

1. Jörg Neuschel, 1557: bore 12 mm; bell 10.9 cm[128] (see Fig. 3 above)
2. Cunrat Linczer, 1587: bore ca. 12 mm; bell 12 cm[129]
3. Georg Ehe, 1619: bore 11.4–11.7 mm; bell 12.5 cm
4. Hanns Hainlein, 1670: bore 12.1 mm; bell 10.7 cm[130]
5. Johann Carl Kodisch, 1683: bore 11.8–12 mm; bell 11 cm[131]
6. Johann Leonhard Ehe II, after 1690: bore 12 mm; bell 13.8 cm[132]

[124] I owe this information to Lori Van Dyke, Research Assistant, the Stearns Collection of Musical Instruments, University of Michigan, Ann Arbor. See also Stanley 1921, p. 131, and pl. 26 (3).

[125] These measurements have been supplied by Dr. Brigitte Wied of the Oberösterreichisches Landesmuseum at Linz. The pitch has not been established, but it is probably B flat.

[126] I am indebted to Dr. Katalin Körmöczi, cited above, for this information. Cf. Gábry 1976, p. 30, and plate showing no. 56.

[127] I owe this information to Dr. Veronika Gutmann, Curator of the Collection of Ancient Instruments, Historisches Museum, Basel. She notes that the date is difficult to read and might be either 1721 or 1727, but the first alternative is evidently correct because, as pointed out by Wörthmüller 1954–55, p. 480, n. 20, Kodisch did not live beyond that year. The inner slides are a little flattened at the ends, but the bore cannot be larger because the [internal] diameter of the outer slides is 11 mm.

[128] Data provided by Prof. Gerhard Stradner, Director of the Musical Instruments Department, Kunsthistorisches Museum, Vienna, from measurements made by Mag. Alfons Huber.

[129] This and the following instrument are illustrated by Young 1980, p. 43, nos. 20–21, where the bell measurement is given. For the first, the bore measurement has been calculated from a full-sized epidiascopic enlargement of Young's illustration. The bore measurement of the second has been provided by Jacques Leguy. I also owe thanks to Mme J. Bran-Ricci, Curator of the Museum of Musical Instruments at the Conservatoire National de Musique in Paris. This instrument is also illustrated by Gregory 1973, pl. 1.

[130] Measurement of the bore supplied by Dr. Manfred Schmid, Director of the Museum of Musical Instruments, Munich. Bell diameter from Wörthmüller 1954–55, p. 447, who mistakenly calls this an alto in D; cf. also pp. 392–393.

[131] Dimensions of the bore again from Dr. Schmid. For the bell, see Wörthmüller 1954–55, p. 453; also pp. 392–393.

[132] Plenkers 1970, p. 56 (no. 124), illustrated p. 85 (1).

D. BASSES (PRECEDED BY APPROXIMATE PITCH, ACCORDING TO MODERN STANDARD)

1. (G) Pierre Colbert, Reims, 1593: bore 13 mm; bell 12.5 cm[133]
2. (between E and F) Simon Reichard, 1607: bore ca. 12 mm; bell 13.9 cm[134]
3. (E flat) Isaac Ehe, 1612: bore 11.8–12.2 mm; bell 12.4 cm[135] (see Figs. 5 and 11 above)
4. (?) Sebastian Hainlein, Sr., 1627: bore 13.5–14.1 mm; bell 11.6 cm. This was cut down to a B flat tenor in the nineteenth century.[136]
5. (F) Petrus Goltbeck, Cottbus, 1635: bore 11.62 mm; bell 12.2 cm[137]
6. (G) Wolf Birckholz, 1650: bore 11.26 mm; bell 12.95 cm[138]
7. (E flat) Hanns Hainlein, 1631: bore 11.3 mm; bell 12.2 cm[139]
8. (F) Hanns Hainlein, 1668: bore 9.3–10.9 mm; bell 12.9 cm[140]

[133] *Ibid.*, p. 58 (no. 131), illustrated p. 85 (2).

[134] Van der Meer 1976, pp. 94–95. Dr. van der Meer has also supplied the approximate bore measurement.

[135] *Ibid.*, pp. 93–94, further information about the bore from Geert Jan van der Heide. Of the pitch, Dr. van der Meer says: "Zwischen D und Es, wohl als Es [E flat] aufzufassen."

[136] Information supplied by Dr. Manfred Schmid. For the bell, see Wörthmüller 1954–55, p. 443. Illustrated in *Ausstellung Alte Musik . . . Veranstaltet durch die Stadt München im Bayerischen Nationalmuseum, November–Dezember 1951*, terminal plate, no. 123.

[137] Heyde 1980, pp. 16, 184: "Fis_1 [F sharp]-Grösse, a^1 = etwa 438 Hz." If F, the pitch would therefore be about 417.

[138] *Ibid.*, pp. 16, 185: "G_1-Grösse, a^1 = 437 Hz." Heyde says it could be used as a "G terz," or as a "quart bass" at a higher pitch.

[139] Heyde 1980, pp. 16, 189–190. Es_1-Grösse, a^1 = 442 Hz."

[140] Information supplied by Dr. René de Maeyer, Curator, Instrument Museum, Brussels Conservatory of Music. Illustrated in Gregory 1973, pl. 2.

Appendix II

CONTEMPORARY MANUFACTURERS OF REPRODUCTIONS[141]

1. Gebr. Alexander, Postfach 1166, 6500 Mainz, West Germany

	Price Quotation (Feb., 1984)
Alto (f or e♭), bore 11.8 mm, bell 9 cm	DM 795
Tenor, bore 11.8 mm, bell 10 cm	DM 865
Tenor-bass (B♭/F) with valve to F, bore 11.8 mm, bell 10 cm	DM 1430
Bass (F) with simple bell bow, bore 14.3 mm, bell 13 cm	DM 1190
Bass (E♭) with simple bell bow, bore 14.3 mm, bell 13 cm	DM 1220

Lacquer and case are extra. May be ordered through Giardinelli Band Instrument Co., 151 West 46th Street, New York, N.Y. 10036; add about 25% for shipping (SAL: "Surface-Air") and duty.[142]

[141] German manufacturers frequently offer a choice between ordinary brass and gold brass (with 15% zinc instead of 30%), the latter at a higher price. Since this option is, in my opinion, totally unwarranted, I have excluded it from the following information. The date of my information concerning prices is given in parenthesis above it.

[142] SAL ("Surface-Air"), available in Germany and Holland, costs about half as much as air freight and is far more convenient since it is delivered by regular residential mail. In ordering from other German manufacturers, one should be careful, though, to specify SAL *if size permits*, since there are restrictions on the dimensions of a package sent in this manner (max. length 75 cm, max. girth plus length 200 cm); otherwise it may be preferable to have the instrument sent by surface post (max. length 106 cm, max. girth 76 cm; or max. length 106–122 cm, max. girth 50 cm). This means that altos may be sent in their cases by SAL, and tenors without cases if the packaging is done with care, while both altos and tenors may be sent in their cases by surface post. Larger packages (basses) would have to be sent air freight or sea freight, entailing further UPS charges as well as a broker's fee to clear customs.

2. Böhm & Meinl GmbH, Postfach 126, D 8192 Geretsried 1, West Germany

	(Spring, 1984)
Alto (f or $e^{\flat}$), bore 10.6 mm, bell 9 cm	$425
Tenor, bore 10.6 mm, bell 10 cm	$450
Tenor-bass ($B^{\flat}$/F) with valve to F, bore 10.6 mm, bell 10 cm	
Bass (F) simple bell bow, bore 13.2 mm, bell 13 cm	$650
Bass ($E^{\flat}$) simple bell bow, bore 13.2 mm, bell 13 cm	$650
Bass (F) with valve to $E^{\flat}$, bore 13.2 mm, bell 13 cm	$650

Lacquer and case are included. Only available through American distributors; the lowest prices, quoted here, are those of Giardinelli Band Instrument Co., 151 West 46th Street, New York, N.Y. 10036. The item not priced is not regularly supplied, but may be ordered.

3. Richard Cook, Historical Brass Workshop, 7 Worcester Square, Boston, Mass. 02118

Offers sackbuts, the first two of which are based on those of Meinl & Lauber and produced by Ronald Collier of Chicago:

	(March, 1984)
Alto ($e^{\flat}$), bore 9.9 mm, bell 9.8 cm	$1325
Tenor ($B^{\flat}$), bore 11.9 mm, bell 12.7 cm	$1475
Bass (F/$E^{\flat}$), bore 11.7 mm, bell 12.4 cm	$2500/3000

The price for the bass, modeled on that of Isaac Ehe, 1612, remains approximate, since it has not yet gone into production. Cases are included, but not lacquer. Tuning bits, if desired, are $150 extra, and crooks may be obtained (to F for the B flat tenor, and a half-step down to $a' = 415$). Authentic mouthpieces, based on ancient models, may also be purchased for $45, regardless of size. All the instruments are decorated, although they have tubular slide stays. Orders must be accompanied by a 25% deposit and there is a waiting period of 2 to 6 months.

The authentic thinness of the metal of the bell section is one of the principal virtues of Ronald Collier's sackbuts. He also offers to thin down the bell of any other modern reproduction to the same degree, for a charge of $100 plus shipping. In addition, he offers a pair of dial calipers of his own invention that enable one to measure the thickness of metal throughout the length of any sackbut bell; the price is $125. His address is 721 School Street, Naperville, Ill. 60540.

4. Adolf Egger, Wallstrasse 9, 4051 Basel, Switzerland[143]

(Oct., 1983)

Alto (f or e♭) after Schmied-Pfaffendorf, bore 10 mm, bell 11.5 cm	SF 2300
Tenor (B♭) after Schmied-Pfaffendorf, bore 10.5 mm, bell 13.1 cm	SF 2400
Bass (F with extension to lower pitch) after Sebastian Hainlein, bore 12.6 mm, bell 13.7 cm	SF 3350

Lacquer and case are extra. The first two instruments are based on eighteenth-century models, but other models may be ordered if the customer provides precise specifications. The bells are too heavy to provide much resonance (0.4 mm thickness), seamless tubing is used, and there is no indication that any of the metal is beaten, so that the instrument cannot be considered exact replicas. The tenor sackbut can alternatively be supplied with a conical bell like that of the Renaissance.

5. Helmut Finke GmbH, Postfach 2006, 4973 Vlotho-Exter, West Germany

(August, 1983)

		(decorated)
Soprano (b♭)	DM 1400	——
Alto (f or e♭), bore 11 mm, bell 10.2 cm (e♭ 10% more)	DM 1400	1700
Tenor (B♭), bore 11 mm, bell 10.2 cm	DM 1400	1700

[143] I owe this information to the efforts of Jacques Leguy, who has gone to considerable trouble in obtaining it.

Tenor-bass ($B^{\flat}$–F), bore 11 mm, bell 10.2 cm	DM 1700	——
Bass (F/$E^{\flat}$), convoluted bell bow, bore 12.5 mm, bell 14.2 cm	DM 1900	2350
Bass ($E^{\flat}$/D), convoluted bell bow, bore 12.5 mm, bell 14.2 cm	DM 2090	2585

Lacquer included, but not case (alto and tenor DM 250; bass DM 300). If ordered directly, there is a discount of 11.5% and SAL ("Surface-Air") shipping charge of about DM 60. The decorated models are "exact copies of museum pieces, even with the tubings hand rolled and the engravings according to the original." The exactness is disputable, however, from the sampling I have seen. All have tuning slides on the bell bow, for example, and the walls of the bell are not thinned down. The slide stays are tubular.

These instruments may also be ordered from the von Huene Workshop (The Early Music Workshop of New England), 59–65 Boylston Street, Brookline, Mass. 02146, at the following prices (1984):

		(decorated)
Soprano	$754	——
Alto	$725	$ 890
Tenor	$725	$ 890
Tenor-bass	$890	——
Bass (F/$E^{\flat}$)	$985	$1200
Bass ($E^{\flat}$/D)	(unknown)	

Cases $90, except bass—$120. Postage additional.

6. Geert Jan van der Heide, Withagersteeg 4, NL 3882MH Putten, Netherlands

(Jan., 1984)

Alto ($e^{\flat}$) after H. Starck, 1670, bore 9.4–10.2 mm, bell 9.6 cm	Dfl. 6300–8100
Tenor ($B^{\flat}$) after A. Drewelwecz, 1595, bore 10 mm, bell 10.3 cm	Dfl. 6700–8500

Tenor (c) after Johann Leonhard Ehe, Jr., ca. 1730 (a′ = 415), bore 9.1 mm (also available with bore 10.5 mm), bell 10.5 cm	Dfl. 6700–8500
Bass (E/E♭) after I. Ehe, 1612, bore 11.8–12.2 mm, bell 12.4 cm	Dfl. 9500–12000

No lacquer or case included. These are exact reproductions of sackbuts in Nuremberg. The higher price covers flat slide stays and a greater degree of embellishment. The time required for delivery is normally one to two years. Shipment may be made by SAL ("Surface-Air") as is done in Germany, except for the large bass.

7. Herbert Lätzsch KG, Schmidtstrasse 24, 2800 Bremen 1, West Germany

(April, 1983)

Alto (f or e♭), bore 10.75–11.10 mm, bell 10 cm	DM 975 ($625)
Tenor (B♭), bore 10.75–11.10 mm, bell 10.5 cm	DM 1170 ($725)
Tenor-bass (B♭), exchangeable bell bow with valve to F, bore 10.75–11.10 mm, bell 10.5 cm	DM 1745
Bass (F) with valve to E♭, bore 12.4–13 mm, bell 14 cm	DM 2350 ($750–800)

Lacquer is provided, but case is extra. 10% discount. Up to 15 months required for delivery. Lightweight (0.3 mm) bells are supplied at no additional cost. Also available in the U.S.A. from Giardinelli Band Instrument Co., 151 West 46th Street, New York, N.Y. 10036; their dollar prices, given in the second column, include case.

8. Ewald Meinl (formerly Meinl & Lauber), Lerchenweg 2, 8192 Geretsried 1, West Germany

(1982)[144]

Soprano (b♭)	DM 2687

[144] I owe this information to Richard Cook, having been unable to obtain it from the firm itself.

Alto (f or e♭) after Nagel	DM 3261
Tenor (B♭) after Hainlein, bore 11.5–12 mm, bell 12 cm	DM 3405
Tenor (B♭) after Drewelwecz, bore 10–10.5 mm	DM 3405
Bass (E♭/D) after Isaac Ehe, 1612	DM 5581
Bass (E♭/D) after Hainlein	DM 4855
Bass (F) after Oller, with interchangeable E crook	DM 4941

Lacquer and case are extra. Prices for flat slide stays furnished on request; to judge from previous price lists, the cost for a tenor with such stays would be about DM 5500. Exact reproductions of various museum sackbuts are also available (prices again furnished on request). The waiting period, formerly two years, has now been reduced to about 12 months.

9. Josef Monke GmbH, Körnerstrasse 48–50, 5000 Köln 30 (Ehrenfeld), West Germany

	(Jan., 1984)
Soprano (b♭), bore 10.5 mm, bell 9.5 cm	DM 800
Alto (f or e♭), bore 10.8 mm, bell 10 cm	DM 960
Tenor (B♭), bore 11 mm, bell 11 cm	DM 960
Tenor-bass with key to F, bore 11 mm, bell 11 cm	DM 1210
Bass (F), bore 11.7 mm, bell 13.5 cm	DM 1390

Additional charges for lacquer, water key, garland (undecorated), German silver or steel inner slides, and case. Also available in the U.S.A. from David H. Green, 1080 Beacon Street, Brookline, Mass. 02146, but at much higher prices, even after allowing for costs of shipment and duty. Monke will make a mouthpiece to your own specifications and will also fill orders for any other mouthpieces, silver-plated (if specified *versilbert*), at DM 84.10, including postage. As a rule this service is remarkably prompt. Figure 21 shows the specifications for the tenor mouthpiece (admittedly rather wide) I use on the narrow-bore Drewelwecz sackbut by van der Heide, and readers are free to make use of them; the outer diameter (*äussere Weite*) of the shank would obviously have to be modified for a wider bore. In my experience one has to be very precise about the amount of beveling (*Abschrägung*) on the edges of the rim.

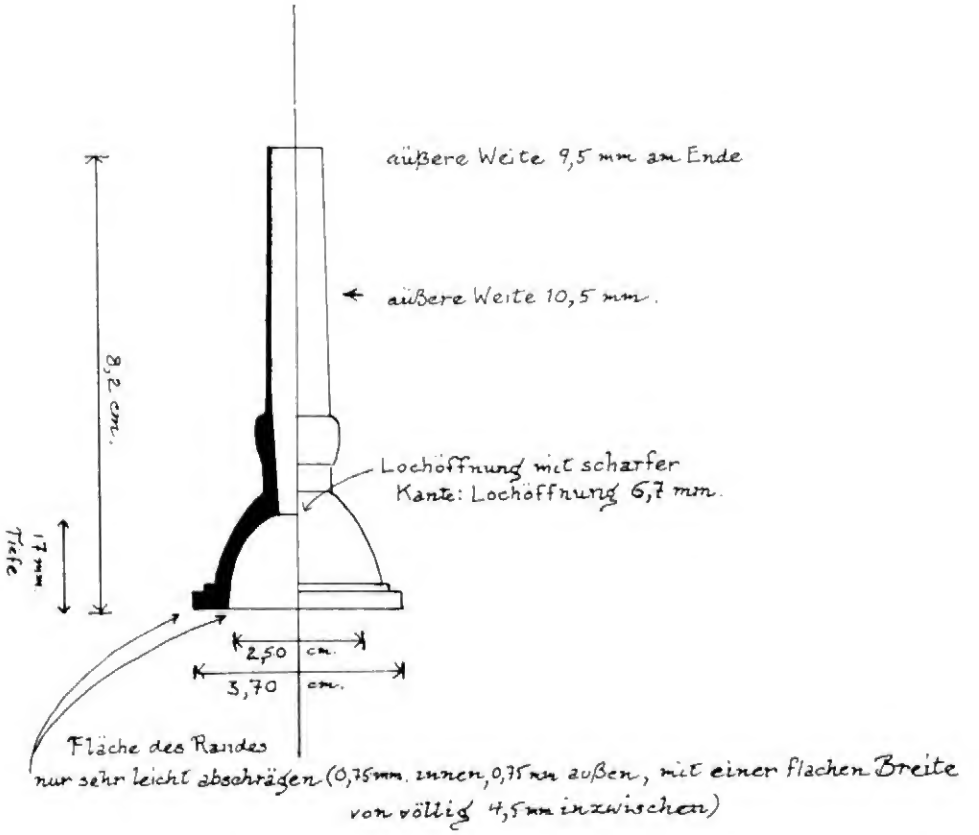


FIGURE 21

10. Wilhelm Monke GmbH, Gutenbergstrasse 59/61, 5000 Köln 30 (Ehrenfeld), West Germany

	(1983)
Alto (f or $e^{\flat}$), bore 10 mm, bell 9 cm	(no price given)
Tenor ($B^{\flat}$), bore 10.3 mm	DM 787
interchangeable bow for A	DM 157
Tenor-bass ($B^{\flat}$–F), with valve for F, bore 10.3 mm	DM 1309
bow for same without valve to F	DM 157
Bass (F), with simple long bell bow, bore 13.9 mm	DM 1122
Bass (F–$E^{\flat}$), with valve for $E^{\flat}$, bore 13.9 mm	DM 1544
Bass (F–C), with valve for C, bore 13.9 mm	DM 1986

Lacquer and case are extra. Prices have in the past been reduced by 10% for export.

11. Max & Heinrich Thein, Stavenstrasse 7, 2800 Bremen, West Germany
Offer a number of exact reproductions, including the following:

(May, 1982)

Alto ($e^{\flat}$) after Michael Nagel, 1656, bore 11.4–11.9 mm, bell 9.5 cm	DM 13,500
Tenor ($B^{\flat}$) after Jörg Neuschel, 1557, bore 11.7–11.9 mm, bell 10.4 cm	DM 14,940
Tenor ($B^{\flat}$) after Sebastian Hainlein, Jr., 1631, bore 10.2–10.5 mm, bell 10.2 cm	DM 14,940
Bass (F) after Joh. Eichgentopf, 1723, bore 12.6–12.8 mm, bell 15.8 cm	DM 15,200
Bass ($E^{\flat}$) after Isaac Ehe, 1612, bore 12 mm, bell 12.4 cm	DM 19,760

No lacquer and no case are included. Prices reduced 8% for export. It should be noted that there is no apparent provision for tuning, although tuning bits are provided for the clarino trumpet. Since they are also specified for the trombone in the article cited in Thein 1981, p. 389, their omission from the sales literature may be inadvertent.

The following summarized list will facilitate reference in my subsequent remarks:

1. Alexander
2. Böhm & Meinl
3. Cook & Collier
4. Egger
5. Finke
6. van der Heide
7. Lätzsch
8. Meinl (& Lauber)
9. Josef Monke
10. Wilhelm Monke
11. Thein

Unfortunately, the value of this information is limited by the fact that I have not been able to play the instruments of all the makers. I have tried the tenor of No. 2, found it rather loud, and subsequently learned, from someone who uses it constantly, that three of the sixth harmonics (d′–e′) were considerably too sharp. As noted earlier, I found the tenor of No. 3 to be admirably resonant, but not so much better than the Meinl & Lauber (No. 8) wide-bore tenor I already possessed, that I felt I should keep it. My satisfaction with the tenor of No. 6 has likewise already been expressed, as well as my reservations about the wide-bore

tenor of Meinl & Lauber; on this latter instrument a single note (f) is also slightly sharp. The tenor of No. 5 (fully ornamented), which I tried at the von Huene Workshop, has something of the desired antique dryness of tone; like the tenor of No. 9 it has an intermediate bore of 11 mm, but this measurement is evidently the internal diameter of the stockings, so that nearly all the slide actually measures about 0.3 mm less, or 10.7 mm.[145] I use the F bass[146] of No. 9, in which I find that B flat is rather weak and requires much practice to strengthen; otherwise the tone is relatively good. The fully ornamented Finke bass (No. 5) I have tried does not seem to have this problem—perhaps because the bore is slightly larger. On the other hand, the bell stay is so close to the level of the mouthpiece that one cannot hold this model correctly. My alto in f (a choice influenced some time ago by Sachs and other authorities), from No. 10, is satisfactory except for a very sharp a′ in first position; subsequently I acquired, from the same source, a narrow-bore tenor that shows the defect of No. 2, mentioned earlier, having three sixth harmonics that are too sharp (e′–f′). Most, if not all, of the low-priced category of German sackbuts tend to use contrasting metal—such as German silver, gold brass or even copper—in the joints or in the garland. As a rule, however, one may specify that the exterior be made exclusively of ordinary brass. So-called "garlands" (usually a simple band of metal tightly fastened to the surface of the bell) are completely unnecessary, especially if one intends to have the walls of the bell thinned down.

The list divides into three price ranges. In the lowest-priced group the tenors cost not much more than $500, in some cases much less, and the instrument is generally ready within 2 months (although the somewhat more expensive ones of No. 7 require much more time, as noted). While the altos generally have a single bell stay (that of No. 7 exceptionally has two), the tenors usually have three (a single stay, however, in the case of Nos. 5 and 9). They have tuning slides that extend much farther forward

[145] Between this and the tenor of comparable bore produced by no. 9, the latter would seem to be the better buy, since it is much less expensive, is equally well in tune, and soft in volume, although lacking the slight dryness of tone that I found in the ornamented Finke tenor.

[146] Here it may be noted that my F bass and f alto, both limited to six positions, have an advantage over their E flat counterparts in that the relatively uncommon F sharp (or f sharp) is lost in the first case, while the more indispensable E natural (or e natural) is lost in the second. The loss is more serious in the case of the bass, so that there is an additional advantage to playing a reproduction that provides for a variable pitch.

on the side nearer the player. The bells are sometimes slightly flared (Nos. 5, 7, 9), sometimes more conical (Nos. 1, 2, 10).

The second price category offers much less choice: Nos. 3 (Cook & Collier), 4 (Egger), and 8 (Ewald Meinl). Here the basic price of the tenor is $1475 in the first case and probably about the same for the third. But the tenor offered by No. 3 has made progress, in that it provides an appropriately thin bell, whereas that of No. 8 has regressed in placing a tuning slide on the bell bow. Furthermore, the waiting period is two months in the first case, and at least a year in the third, with no certainty that your order will be accepted at all. I ordered a case from Meinl in October 1983, and have heard nothing since. Egger (No. 4) is only just getting under way with his production, despite the date of his price list. His tenor is priced more moderately than Nos. 3 or 8, but, like the latter, it fails to provide sufficient thinness in the bell, and the prototypes of the alto and tenor are eighteenth century. The waiting period is unknown.

The third category again embraces No. 8, for Ewald Meinl continues to make exact reproductions of museum pieces and a Polaroid detail of a Meinl & Lauber replica of the Erasmus Schnitzer 1551 tenor, sent to me in 1980, seemed to indicate that they used beaten metal, but I have not been able to confirm that or any other detail, including the price. The price of a fully decorated tenor with flat slide stays would have been $2772 if ordered from No. 6, as compared with $5053 if ordered from No. 11 (as reckoned by the value of the Dutch guilder [Dfl.] and the West German mark [DM] on June 12, 1984). Apart from this very considerable difference, I have received a disquieting report from a professional musician who purchased a coiled horn from the Theins and has visited their workshop. The horn proved to be out of tune, and he found that the workmanship of the Neuschel tenor left much to be desired. He adds that others too have found their work unsatisfactory.

There is little doubt that my list is incomplete despite considerable efforts to discover all the possibilities. I have tried, without success, through personal contacts in Mainz, to establish the identity and address of Max Enders, whose sackbuts were used on the recording "Ludwig Senfl: Sacred and Secular Music" (Musical Heritage, MHS 1390)—only to learn that he must have died some years ago.[147] The modern sackbut

[147] The 6th edition of Lyndesay G. Langwill's *An Index of Musical Wind-Instrument Makers*

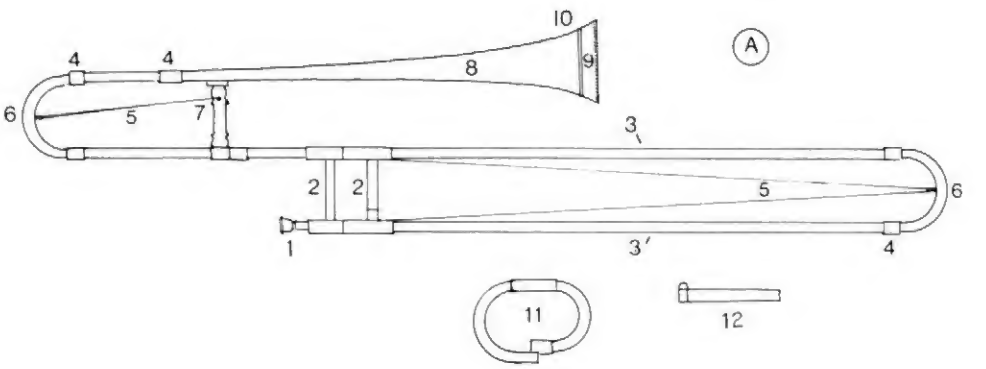
by Boosey & Hawkes, shown in David Munrow's *Instruments of the Middle Ages and the Renaissance* (London, 1976), pp. 65, 68, bears little resemblance to its prototype, the Jörg Neuschel 1557 tenor, or to any ancient sackbut. As Alan Lumsden and Christopher Monk have informed me, it incorporates an Aida trumpet bell, and the working out of the rest of the instrument proved so difficult that the company charged nothing and vowed henceforth to forswear sackbuts completely. Mr. Monk also informs me that the "sackbuts" attributed to Peerless of Birmingham, Selmer of Paris, and Besson of London on the record set "Art of the Netherlands" (Seraphim SIC 6104) are simply trombones with their bells cut back to a point where the diameter was greatly reduced. As a rule, the English "sackbuts" produced in this manner were made from antique narrow-bore instruments, sometimes known as "peashooters."[148] From what has been said in the preceding pages, it should be clear that such an expedient is quite inadequate. Moreover, one regrets the mutilation of some antique trombones that may have some musicological interest in their own right.

(Edinburgh, 1980), p. 47, indicates that his production extended through 1903–1935. Another possibility has likewise been eliminated; contrary to the *Directory of Contemporary American Musical Instrument Makers* by Susan Caust Farrell (U. Missouri, 1981), p. 122, Schilke Co., of Chicago, does not make Renaissance trombones.

[148] Bate 1966, p. 55 (2nd ed., 1978, p. 60); this preference was probably influenced by the high pitch ($a' = 450$) favored by British military bands.

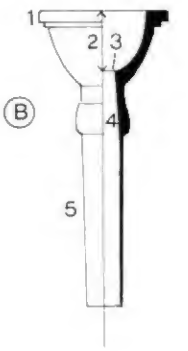
Appendix III

ENGLISH, FRENCH, AND GERMAN NOMENCLATURE



A. Sackbut	*la saqueboute*	*die Barock-Posaune*
1. Mouthpiece	*l'embouchure* (f)	*das Mundstück*
2. Stay	*la barrette*	*das Querrohr* (round); *der Quersteg* (flat)
3. Slide	*la coulisse*	*der Zug*
4. Joint, ferrule	*l'anneau* (m)	*die Hülse*
5. Cord binding	*la ficelle à l'attache*	*die Fadenwicklung*
6. Bow-bend	*le coude en forme de U*	*der U-Bogen*
7. Bell stay (hinge at top)	*la potence (le gond en haut)*	*die Schallstütze (das Scharnier oben)*
8. Bell	*le pavillon*	*das Schallstück*
9. Garland	*la couronne*	*der Kranz*
10. Flare	*l'évasement* (m)	*die Stürze*
11. Crook	*le corps de rechange*[149]	*der Krummbügel*
12. Tuning bit	*la rallonge d'accord*	*das Stimm-Setzstück*

[149] Bate 1966, p. 136 (2nd ed., 1978, p. 144), notes that this device was called *tortil* by Mersenne (1636) and in contemporary English a "wreath." Cf. also English "tortile," meaning "twisted, coiled."



B. MOUTHPIECE	*l'embouchure*	*das Mundstück*
1. Rim	*le rebord*	*der Rand*
2. Depth of cup	*la profondeur de la cuvette*	*die Kesseltiefe*
3. Throat	*l'ouverture au fond de la cuvette; le grain*[150]	*die Lochöffnung*
4. Backbore	*l'évasement du conduit*	*die Mundseele*
5. Shank	*la queue*	*der Zapfen*

OTHER TERMS[151]

(Slide) bore	*la perce (le diamètre de la coulisse intérieure)*	*die Mensur (des inneren Zuges); der Luftdurchlass*
Lever (for bass)	*le levier*	*die Zughandhabe; der Anstoss*
Brass	*le laiton*	*Messing* (n)

[150] Bate 1966, p. 67 (2nd ed., 1978, p. 73), notes that *grain* is sometimes used in English, as are also *bassin* (synonym of *cuvette*) and *queue*.

[151] The term "stocking" might also have been included, but I am not sure of the French equivalent; this may be *la manchette*, to judge from German *die Manschette*, also known as *der Anschuh* (Heyde 1980, p. 45). The term "position" is the same in all three languages.

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